THE

JOURNAL OF GAS LIGHTING,

&c., &c.

Vol. LIV.—JULY TO DECEMBER, 1889.

THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

AND

SANITARY IMPROVEMENT.

VOL. LIV.

July to December, 1889.

LONDON:

WALTER KING,

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THE JOURNAL OF GAS LIGHTING
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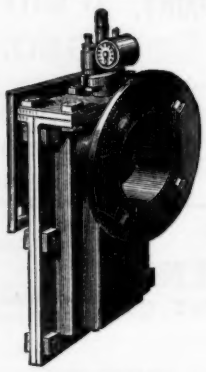

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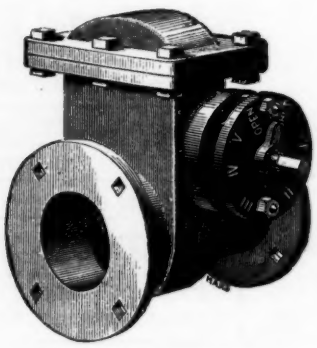

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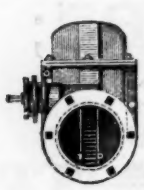

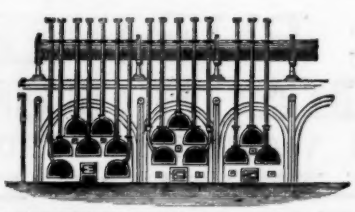

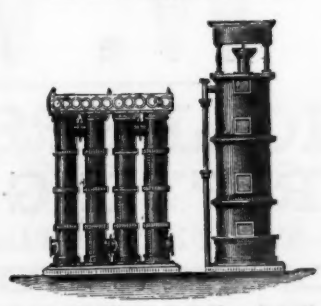

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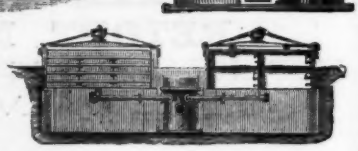

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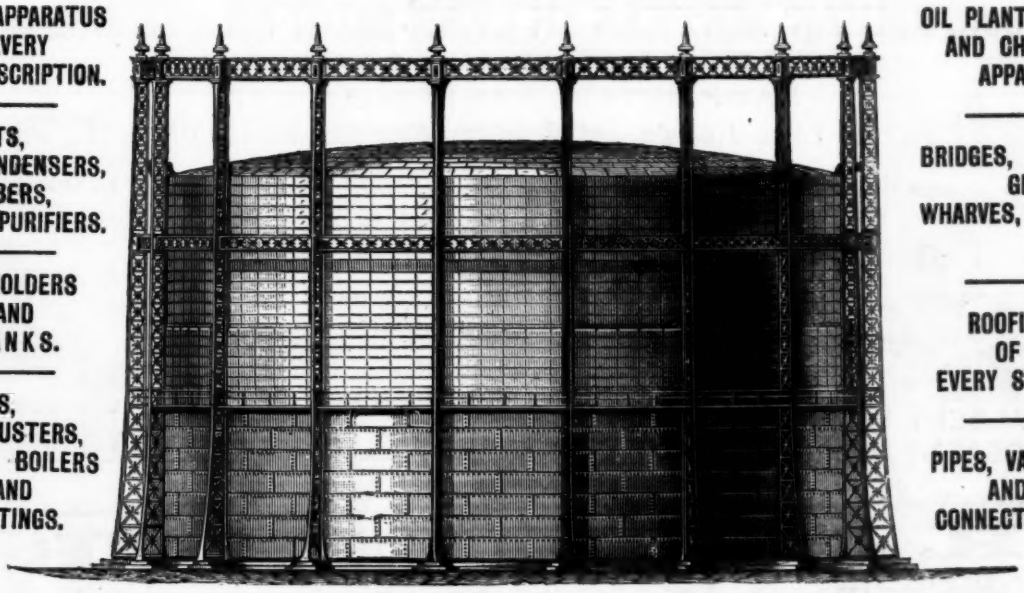

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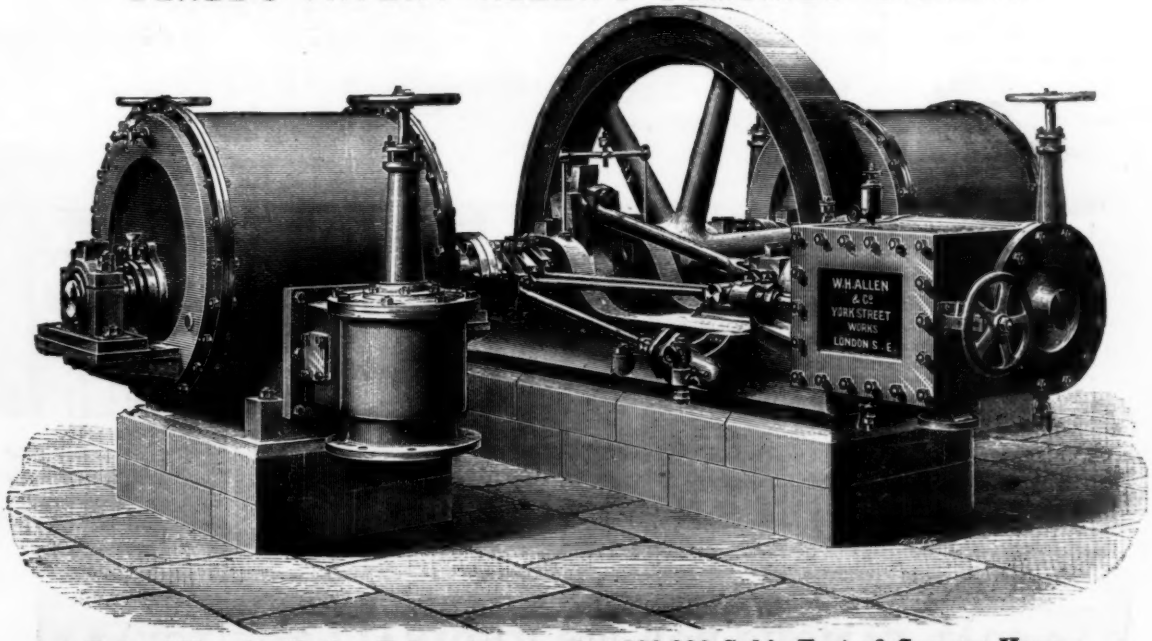

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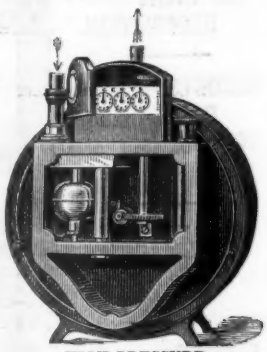
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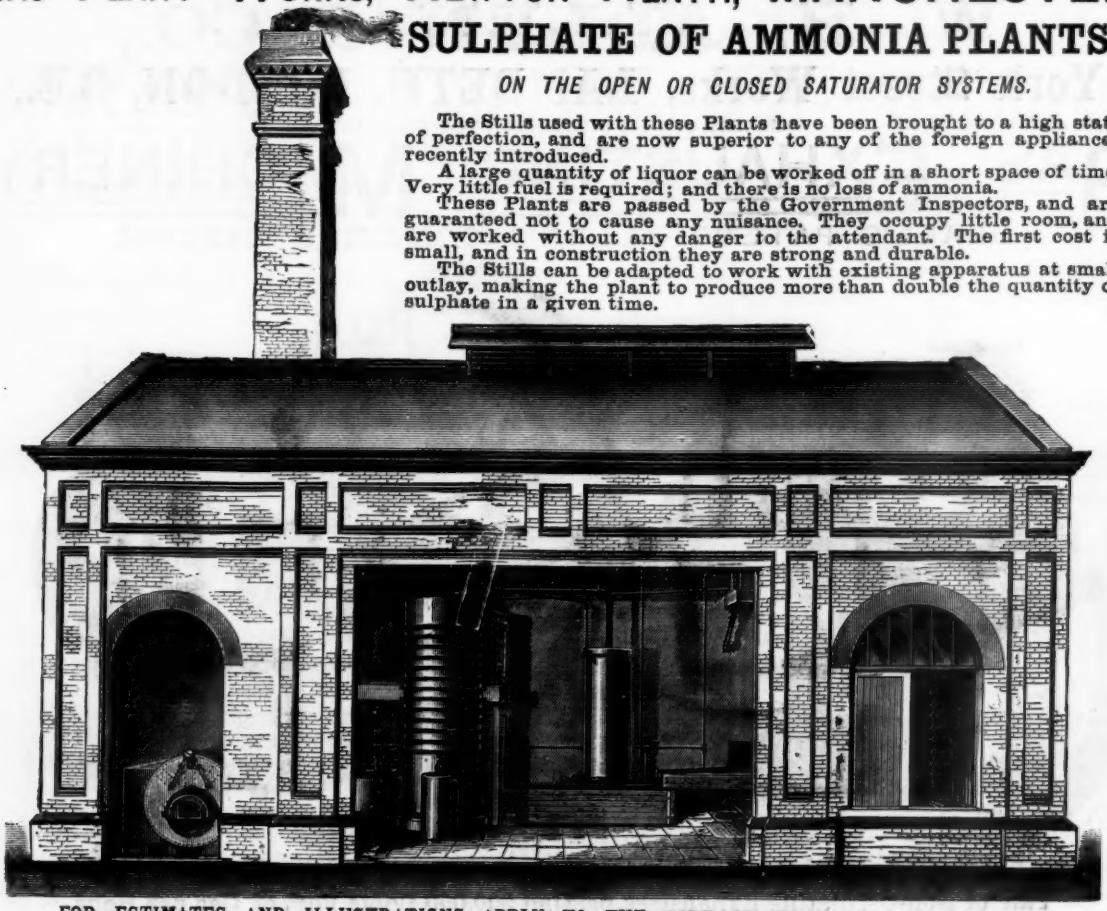

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Further particulars may be had on application to A. F. Wilson, Esq., Assoc. M. Inst. C.E., 12, Walbrook, London, E.C., Agent for London; J. E. Fisher, Esq., Stourbridge, Agent for the rest of England, Wales, and Ireland; or to the Patentee—

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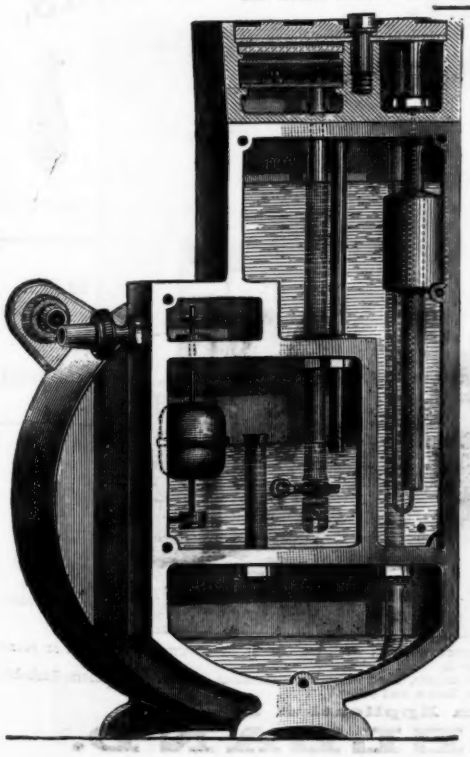

Sole Makers of Green's Patent Underground Wet Gas-Meters for Street Lighting, &c., and Ogden's Patent Spindle Tube for Wet Gas-Meters.

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Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost. No box is required, and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s., and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 8½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid, which does not injure the fittings; and this can be supplied at about 1s. per gallon.

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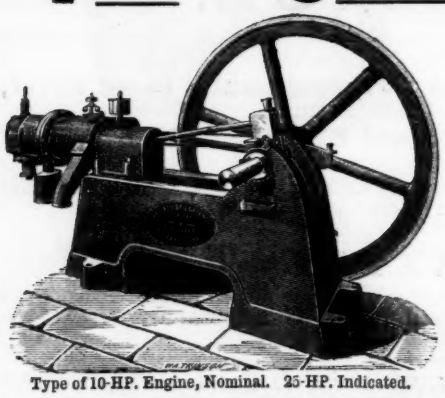

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Testimonial from Mr. JAMES MOON, Engineer to the Filey Gas-Works.

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GENTLEMEN,—We have been using one of your Gas-Engines on our Works for about four months, and I have pleasure in saying that it does its work in a very satisfactory manner. The engine is half-horse power, steady in all its movements, and, with ordinary care, will drive the exhaust apparatus at an even gauge.—I remain, Yours respectfully,

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NO SLIP.

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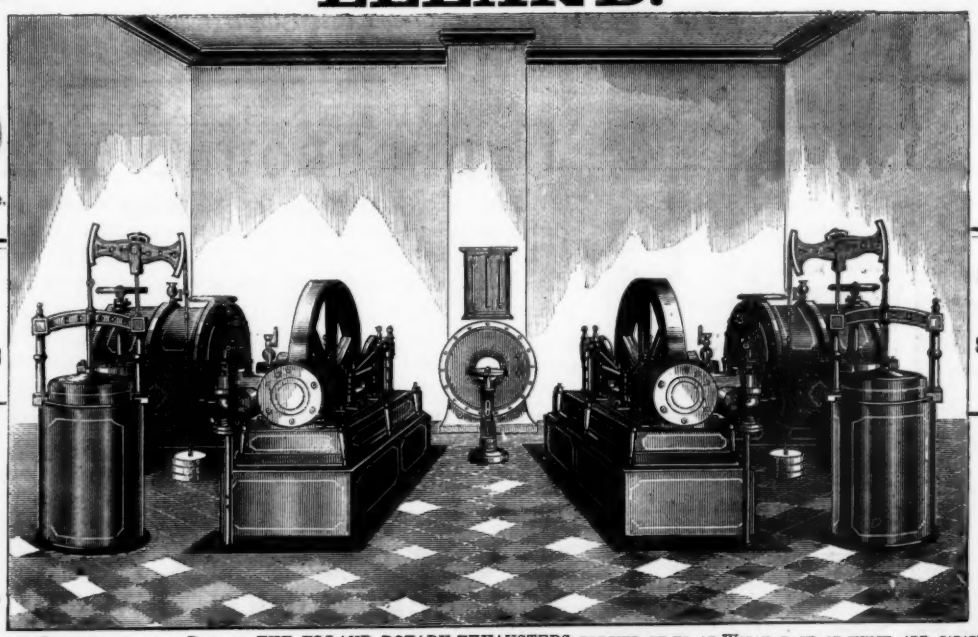
No. 3. Screw Valve.



No. 5. Screw Valve.

NO HIGH SPEED

STEADY GAUGE.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

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Testimonials and References on Application to

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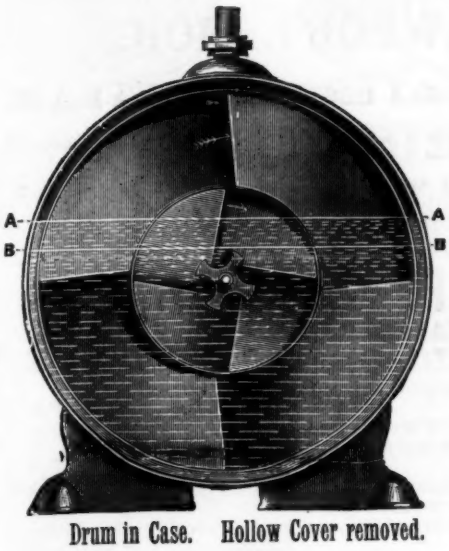
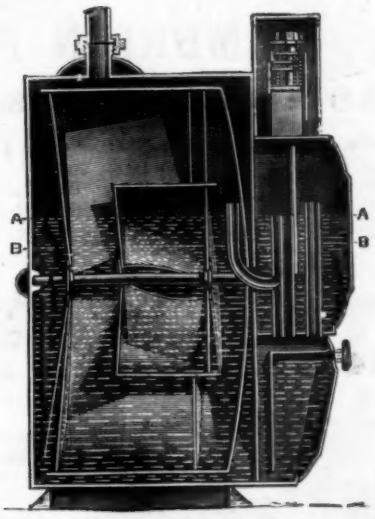
THE WARNER AND COWAN METER.



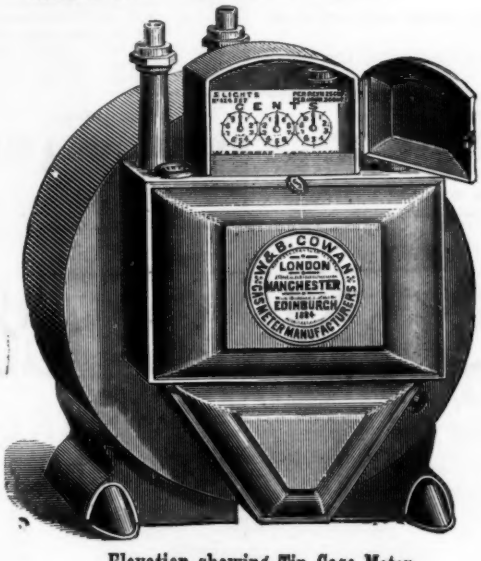
A A, High-Water Line.

B B, Low-Water Line.

Drum in Case. Hollow Cover removed.



Sectional Side View of Meter.



Elevation showing Tin Case Meter.

Elevation showing Cast-Iron Case Meter.

In its completeness as a measure, the WARNER AND COWAN drum differs from every other. Of definite capacity, irrespective of the water-line, it can neither be over nor under filled, but discharges at each revolution the same volume of gas.

It is to this also that its secondary, though important, advantage is due—viz., the long float-range which this drum permits.

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The drum being of fixed capacity within itself, the extraneous mechanism and arrangements are of the most simple character. These include all that is necessary, but exclude all that would be superfluous.

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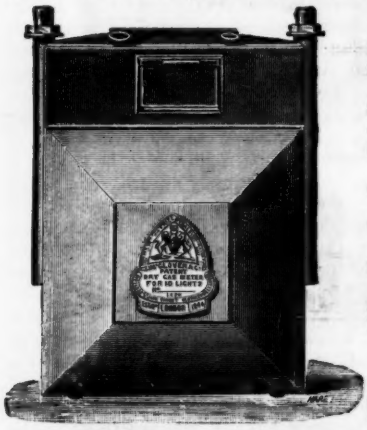

1st—Are a remedy for all the defects of Wet Meters
2nd—Are suitable for all climates, whether hot or cold.
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4th—Cannot become fixed by frost, however severe.
5th—Are the most accurate & unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.
Are upheld for five years without charge.

Meters fitted with Grey's Index or Harding's Counter.

W. PARKINSON & Co.

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IN TINPLATE OR CAST-IRON CASES

COMBINE THE FOLLOWING IMPORTANT IMPROVEMENTS:—

Parkinson's Patent Three-Partition Measuring Drum { *Ensures perfect accuracy of measurement with the least possible friction, works with the greatest ease, and is free from complication of any kind.*

Slow-Spoon Compensator { *Maintains an unvarying Water-line without any appreciable friction, and provides a large reserve of Water. Has stood the test of Time.*

Enclosed Float { *Allows sudden or excessive pressure on the Inlet without affecting the working of the Meter, or extinguishing the Lights.*

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[See also Advt., p. 40.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 2, 1889.

THE GAS STOKERS' AGITATION IN THE SOUTH OF LONDON.

THE agitation among the London gas stokers respecting their hours of work and pay has culminated, so far as the South Metropolitan men are concerned, in an interview between the Directors and delegates from the retort-house gangs of the different stations of the Company. This meeting took place on the 19th ult.; and a condensed report of the proceedings will be found in another column. It will be seen therefrom that there was on this occasion a perfectly free and amicable interchange of views between the Directors and Engineers and the workmen. All the "fustian" about the stokers being downtrodden slaves of bloated capitalists, &c., which, uttered by professional agitators, has amused the men at their recent Sunday mass-meetings, and presumably made "good copy" for such of the London evening newspapers as truckle to the many-headed, disappears from this record of straightforward talk between masters and men. Both parties knew perfectly well what they were talking about; and it was not long before the nature and extent of the claims preferred by the men were made clear. Mr. George Livesey presided, and opened up the subject of the conference in an address, the key-note of which was that the Directors and officers of the Company could meet the men with clear consciences, seeing that they were not aware of ever having acted harshly or unfairly towards them, and had tried to ameliorate the conditions of their employment by introducing Sunday rest, granting a yearly holiday with pay, helping in the establishment of sick and pension funds, and in other ways making the gas stoker better off than most other unskilled labourers. Unlike railway hands and colliery workmen, gas stokers' wages are not reduced during bad times; but if, when the Companies appear to be doing well, the men think they might have a share in this prosperity, without reflecting that they are not called upon to bear any loss in times of adversity, their employers are not required to be angry at what is, after all, only a bit of human nature. Certainly there has not been anything like anger on the part of the heads of the London Gas Companies respecting the petitions of the men for shorter hours and more pay. They have offended the professional agitators, and newspaper reporters with imperfect ideas of fairness to both sides in labour disputes, by preferring to treat with their men direct; but that is an action which will not weigh heavily upon their consciences. At the Old Kent Road, there was manifested throughout a patience in hearing the men, and a desire to accept everything that could be shown to be right in their statements, which, we are sure, have been equally characteristic of the other London gas-works officials who have been engaged of late in similar negotiations. The only people with whom the gas engineers have had no patience in this matter are the self-seeking demagogues who have endeavoured to climb into notoriety upon the shoulders of the stokers, and who have in many instances displayed an ignorance of the conditions of the work of those whom they have essayed to advise, that disentitles them to any serious notice.

At the recent interview, the South Metropolitan men laid before the Directors a number of grievances, many of which were of a trivial nature, in addition to their claims for less work and more pay. This is only what might have been expected in the circumstances, for men of the labouring class have small sense of proportion, and are quite likely to waste time on such occasions with petty complaints that could be remedied by a foreman. In all large factories, there is sure to be the typical grumbler, who feels convinced that he is being imposed upon in some undefined way; only he is "no scholar," and cannot find out the iniquity of his superiors. As a matter of fact, there was no real dispute about the eight-hour day; for the wind was taken out of the sails of the agitators outside by the statement of the Chairman that the men might have had this system two years ago if they had so wished. The offer was made, but the men did not see any advantage in the change, if it was not accompanied by any advance of pay. It was admitted by the Chairman that, in certain of the stations, the work of the stokers had been somewhat increased of late years; so, taking the whole matter into consideration, it appeared to be a case for compromise. This has been done; and we are to-day able to publish the *ultimatum* of the Board upon the representations of the men. The full text of this announcement (which, we believe, was posted in the works of the Company yesterday) will be found elsewhere. It amounts to little more than is required for putting into formal shape the ideas expressed by the Chairman and other head officials before the deputation. After reciting the advantages enjoyed by the men in comparison with the ordinary run of unskilled labourers, the statement goes on to promise that the pay of the various grades of retort-house men will be increased by 8d. per day, with allowances, if the twelve-hour shifts are retained. If the men prefer to work

eight-hour shifts, the Directors will not raise any objection, but the pay will be after the present rates, although the work will be reduced from 96 to 80 mouthpieces for a three-handed gang. If the number of mouthpieces is still further reduced, the pay will be proportionately diminished. The men are to elect by Friday next which system they prefer; and, failing any notification, the work will be continued on the twelve-hour system as at present, with the additional 8d. per day promised. In any case, the regular men will be required to enter into a mutual agreement with the Company to give and receive a month's notice before leaving the service or altering the system of working. It now remains to be seen whether the men, as a body, will prefer leisure to pay.

We are not disposed to discuss the terms of the proposed settlement, or to tender any advice to the men as to the course they should take. We hold our own views as to what the stokers are more likely to do; but will wait and see the result of Friday's action. It is at least certain that the Directors have stated neither more nor less than they are prepared to stand to, come what may. If the men are not absolutely carried away by the counsels of their outside advisers, who never did and never will do anything for them beyond talking, they will trust their employers, whom they have known long and learnt to respect. Pay and position such as are held out to the stokers in this proclamation are not to be despised by men who know the value of labour in every market. If these were thrown up, it would be difficult to find anything so good elsewhere. We always advocate the payment of the highest possible rates of salaries and wages to gas-works officials and workmen. But there is reason in all things; and the man, be he officer or labourer, who does not know when he is well off, is nothing more nor less than a fool.

THE RAILWAY AND CANAL TRAFFIC ACT.

Following up his recent communications on the subject of the bearing of the Railway and Canal Traffic Act, 1888, upon gas undertakings using railway-borne coal, Mr. J. Deakes, of Worcester, has issued a printed circular to gas managers and others interested in this question, inviting joint action to prevent what he regards as an imminent act of oppression on the part of the Railway Companies. The terms of this circular will be found elsewhere; and we are authorized to invite any gas manager willing to co-operate in maintaining the *status quo* against hurtful innovations to communicate with him for this purpose. Many favourable communications pointing to joint action, have already been received, as we are informed, by Mr. Deakes. It has been explained that the Railway Companies were considering the reserved question of the legality of rebates to Gas Companies; and it now transpires that the result of their deliberations is unfavourable to the continuance of these allowances, on the ground that they would constitute an "undue preference" which would render the Companies liable for heavy damages. To this argument Mr. Deakes opposes the common-sense rejoinder that, so far as Worcester is concerned, his Company will guarantee the Railway Companies, securing them from any action on this score; and he recommends others to do likewise. Moreover, it is proposed to raise a fund for taking Counsel's opinion on a case to be submitted to the Board of Trade and the Railway Commissioners, setting forth the grounds on which gas coals should be excepted from the provisions of the Act which now appear to press heavily upon them. One is tempted to ask why the onus of organizing combined action of the kind now contemplated should be left upon the shoulders of Mr. Deakes, who is in reality only one of many gas managers equally interested in this matter. The Gas Institute cannot be expected, under the present circumstances, to act as representing the interest of gas supply in an emergency of this nature; but if the Gas Companies' Association does not embrace such a matter in its purview, then one is disposed to ask whether it might not be possible or desirable to form a Gas Trades Section of the London Chamber of Commerce, as the electricians have done for their trades, with a view to watching over the interests of gas supply when threatened. Just now the duty of speaking generally for the gas industry seems to belong to everybody; and we all know that what is everybody's business is nobody's. We are quite open to receive communications upon this important subject; but for the present, and with special reference to the Railway and Canal Traffic Act, we can heartily recommend all who are interested in the subject of the possible changes in railway rates for coal by the train-load under the new legislation, to put themselves in communication with Mr. Deakes, and seek counsel with him regarding the best steps to be taken to secure protection while there is time.

SHOPKEEPER-WORSHIP IN BIRKENHEAD.

There has been a curious discussion in the Birkenhead Town Council upon the proposal of the Gas and Water Committee to fit up cottage property for gas upon a hire-purchase system. The scheme was elaborated by Mr. T. O. Paterson, the Gas Engineer, and Mr. Birnie, of the Committee's finance department, and started from the suggestive truth that there are about 1200 houses in the borough to which service-pipes are laid, but which are lit by oil. Messrs. Paterson and Birnie justly remark upon this fact that there is good reason for supposing that the first cost of interior fittings, which in the ordinary way would have to be paid for at once, is the great obstacle to the use of gas by occupiers of this class of houses. They therefore recommended that the Gas and Water Committee should come to the rescue, and secure a number of gas consumers who could not otherwise be touched, by the very obvious expedient of offering to put in the necessary fittings on the three-years' hire-purchase system, pointing out that there was nobody else to do anything of the kind, and that therefore the Committee could not fairly be reproached with entering into competition with local tradesmen. It appears, however, that the Corporation of Birkenhead are wonderfully tender in regard to the so-called interests of the tradesmen of the town, and this "revolu-" tionary" project has accordingly been vetoed. All Birkenhead was up in arms about the scheme, which was denounced in a local newspaper as an "ill-advised experiment " doomed to disastrous failure." The gas undertaking would be ruined by such a harebrained adventure, the tradesmen whose legitimate rights were to be outraged would rise in their dozens, and Birkenhead would become the laughing-stock of the nations, if the Corporation were to listen to the seductions of Messrs. Paterson and Birnie! One wonders what would have been said if the recommendation had been like that which Mr. Valon carried for Ramsgate without a dissentient voice—to absolutely give away the fittings in certain cases? To all appearance the local shopkeepers, whose interest outweighs all others in the Corporation, would then have lynched Messrs. Paterson and Birnie. Seriously, this affair of Birkenhead is an illustration of the manner in which a progressive gas manager may be hampered by a body of narrow-minded "ratepayers' representatives." There are some towns in the kingdom where the shopkeeper appears to be an object of worship. If there are not half-a-dozen gas-cookers in the town and the gas manager suggests hiring them out by his Committee, he is sternly reproved for interfering with private trade—although the trade, so far as the immediate subject is concerned, has no existence. If shopkeepers' signs were still in vogue, that of the "Dog in the " Manger" ought to be very conspicuous in Birkenhead and some other places we could name.

MANCHESTER GAS AFFAIRS.

It remains to be seen what effect the three letters upon the administration of the Manchester Corporation gas undertaking, signed with the easily recognizable initials "T. N.," which appeared in our two last numbers and to-day, will have upon the consumers and their oppressors in the City Council. The writer has "delivered his soul" upon the question; and if the Gas Committee were challenged to produce a non-aldermanic defence of their policy worthy of being regarded as an answer to this indictment of it, they would be puzzled, for nobody ever heard of a capable gas engineer willing to argue for gas being maintained at 10d. per 1000 cubic feet above the price at which it ought to be sold. The only possible reply to the charge of "T. N." is the merely brutal one that the majority of the City Council have the power of squeezing the poor gas consumers to make good the leaks in the treasury, and they mean to exercise it. Manchester gas administration is a by-word with all who know anything about the subject. If the Corporation were compelled to submit their policy to the judgment of Parliament, which was the lot of Oldham a few years ago, they could scarcely dare to take it into the committee-room. No professional witness could save them from a sweeping condemnation. How this has come about is not for us to inquire; but we can easily show what ought to be done to improve matters for the future. The gas question should be made a matter of local politics, and the wards awakened to the injustice that is being done to gas consumers and also to ratepayers in order

that Corporation waste and mismanagement may have a buffer between itself and the plundered people. If the thing were properly managed, Manchester might be swept from end to end with the cry "let every tub stand upon its own bottom," upon which our correspondent rightly lays stress. If the virtue of this principle has not yet been appreciated by the voters, it should be for the reformers to instil it into their understandings. Let the gas consumers, and all ratepayers who are solicitous for economy in the use of their money, form in every ward Gas Reform Associations—not for discussing trivial questions of overcharges, "bad gas," and other illusions with which the partizans of indirect taxation in the Council would be only too glad to see them amused, but for consolidating into one body the voters who want cheap gas and direct responsibility of the spending departments to the ratepayers. In many, possibly in the majority of the wards, such an Association might hope to secure the controlling power in elections; and then all candidates would become keenly alive to the advantage not only of professing Free-Trade principles, but also of practising them in local matters. A few pointed addresses, delivered by competent speakers, who could easily be found within the City, would suffice to lay the foundation for such a party; and its consequences would speedily become visible. The great point to bear in mind for the conversion of local indifferents and waverers, is that made at the close of his letter by our correspondent last week. The case is so tersely put there that it is worth while to repeat the paragraph entire. "The question," he says, "is one that concerns not only the gas consumers, but "also the general body of ratepayers. As a matter of fact, the "carrying of these large sums to 'aid the rates' does not "reduce rates at all. Their effect has been to encourage waste "and extravagance and corruption. There would be greater "economy in municipal administration if the municipal rates "were levied direct, and the iniquitous system of overtaxing a "part of the community by indirect methods were abandoned." This is the argument we have always employed in connection with the same subject; but its appropriateness must be keenly appreciated by every Manchester man who walks down Market Street and sees before his eyes the monument of municipal folly. This question of gas reform for Manchester has smouldered for years. It now appears to have livened up into a little blaze; but it will die down again, without leaving more lasting effects than a Belle Vue sky-rocket, if nobody takes advantage of the opportunity for ensuring redress by constitutional means.

ANOTHER STREET-LIGHTING DISPUTE IN DUBLIN.

There is another of those pretty little quarrels between the Dublin Municipality and the Alliance Gas Company, which so often diversify life in the Irish capital; but this time the duel has assumed a "three-cornered" aspect by the intervention of the public in a distinct character. The only reason for the existence of the public Inspector of Lighting in Dublin, as candidates for the office learnt on the occasion of the last ostensibly open competition for it, is to cut down the amount of money paid to the Gas Company on account of the street lighting. After a variety of attempts with this object, to which we have referred on several occasions, the last happy thought of the Inspector or his Committee has been the premature extinction of the street lamps, and the partial adoption of a great system said to have been imported from Manchester, but which is nothing more nor less than our old friend the "moon schedule" very thinly disguised. Now, although the moon schedule may work fairly well in quiet rural localities, where everybody is supposed to be indoors, if not in bed, by ten, it is scarcely sufficient for the city of Dublin. Naturally peaceful, sober, and law-abiding, as we have lately learnt to regard the Irish nation on the whole, their best friends must admit that there are a few black sheep among them—of foreign origin, mayhap—who are not above taking advantage of a dark night for the perpetration of mischief not always harmless. As a matter of fact, some individuals of this order—or rather want of order—signalized the triumph of Corporation economy in Dublin by wrenching off knockers, and perpetrating other practical witticisms of the kind which we prefer reading about in the pages of Lever and Marryatt to experiencing in connection with our own domiciliary arrangements of the present day. At any rate, the sense of humour has been so seriously depreciated in the Irish mind, that the victims of these midnight freaks complained of the darkness which rendered them practicable. The Corporation replied that the complaint was ill-founded, and that their Lighting Inspector of the present—Mr. T. J. Cotton—did no more in the way of unduly curtailing light than his predecessor and brother, Mr. W. F. Cotton, now Secretary of the Alliance Gas Company, did in his day. The latter gentleman has replied, denying the impeachment; and a newspaper backs him up in fine style. So the merry game goes on. The Lighting Inspector is bound to prove his utility to his Committee by stirring up the Gas Company or trying some new arrangement with the street lighting at frequent intervals. Thereupon the Company protest; there is some "sparring" in the Council Chamber and the newspapers; but nobody means anything serious. It is only a "family jar;" and so matters stop until the next outburst. The public must like the fun, or they would not endure it month after month and year after year.

THE APPROACHING LAPSE OF THE LONDON COAL DUES.

The Committee of Parliament charged with the task of elucidating the condition of the reported rights of the City of London in the matter of taxing coal consumed within the Metropolitan area have begun their labours, and the evidence which they have taken is rather curious. So far, as might have been expected, the supposititious rights of the City in this regard appear to be of the flimsiest nature; and it will be very surprising if the Committee find they are much more respectable than an infinity of other seignorial privileges which according to the letter are still existent in all parts of the country, but have been wisely allowed to grow venerable as historical relics instead of having been made really intolerable by foolish insistance in their exercise. The Committee will have to report in due form, of course; but we are pretty confident in stating that on and after Friday next, the 5th inst., the London coal dues will cease to annoy the trade and manufacture of the residents in the capital. Meanwhile, some of the newspapers, notably those which profess to mirror civic opinion, continue to protest that it is inconceivable how London will get on without the revenue hitherto derived by its local authorities from the dues. There must be public improvements of all sorts, it is plaintively argued; and where is the money to come from? Why, of course, from the same source as it does in places which have not the dubious benefit of indirect rating, and which are on the whole quite as well kept up as towns where the coal or gas consumer is doubly taxed. There is no pessimist like your indirect taxmaster when he sees before his eyes the dread prospect of losing his dear subsidy.

Reduction in the Assessment of the Stockton-on-Tees Gas-Works.—The Corporation of Stockton-on-Tees have recently appealed to the Assessment Committees in Stockton and Middlesbrough against the assessment of the gas-works undertaking in the townships of Stockton and South Stockton (the latter in the Middlesbrough Union), with the result that a reduction of £1931 has been made in the former, and of £470 in the latter. This reduces the amount payable as rates by £527 per annum. Messrs. Hedley were the valuers for the two Unions; and Mr. Thomas Newbigging, C.E., acted for the Corporation.

Effect of the Coal Strikes in Germany.—As an instance of the enormous expenses which have been caused generally throughout the German Empire by the recent strikes of miners in Westphalia and other colliery centres, and the consequent rise in price of German coal, may be cited the fact that at a recent meeting of the Cologne Corporation, during the discussion of the vote for the requirements of the municipal gas-works for the winter 1889-90, it was reported that the making of contracts for the delivery of the requisite quantity of material was accompanied with the greatest difficulty, and necessitated an additional vote of 230,000 marks (about £11,500) in comparison with the expenditure for the previous winter.

Presentation to Mr. R. J. Lukey.—Last Tuesday afternoon, Mr. R. J. Lukey, late Secretary of the Falmouth Gas Company, who is about to leave for Australia, was the recipient of a beautifully mounted photographic group of the Manager and workmen in the Company's employ. In making the presentation, Mr. J. W. Buckley, the Manager, referred to the desire of the workmen, on their becoming aware of Mr. Lukey's departure, to mark their appreciation of his kindness to them during the many years he has been connected with the Company. They selected this as the best form of expression; and, in asking Mr. Lukey to accept it, he wished him, on behalf of the workmen and himself, every prosperity in his new sphere of labour. Mr. Lukey thanked the Manager and workmen for their unexpected and handsome testimonial, which would always remind him of his pleasant association with them. The testimonial bore the following inscription:—"Presented to Mr. R. J. Lukey, Secretary, by the *employés* of the Falmouth Gas Company, on the occasion of his appointment as Assistant-Secretary to the Sydney Gas Company, as a token of respect and good wishes."

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 29.)

The general tendency in the Stock Markets during the past week was downward; though there was a slight rally before the close. The Gas Department, however, was firm and steady; and, with one special exception, all variations in price are for the better. There was much more activity than of late, especially in issues which are less frequently dealt in. A fair amount of business was done in Gaslight stocks; the "A" closing firm at a rise of 1. South Metropolitans are quiet and unchanged. A single transaction was marked in Commercial old, after which the stock rose 2. Among the Suburbans and Provincials, there has been business at good average figures in Brentford and Crystal Palace; but no change of quotation. In Foreigners, the most noticeable items are a further drop of 1 in Buenos Ayres, and a demand for Bahia. Water has been almost wholly neglected; but Lambeth shares have improved, while the debenture stock is a point easier.

The daily operations were: Moderate business on Monday in gas, at steady prices; but Buenos Ayres fell ½. Nothing to note in Water. Gas was still moderately active on Tuesday, and prices were good generally. Buenos Ayres debentures were in demand, though the shares were still weak. Water was a blank. Gas was the same on Wednesday; prices being steady throughout. There was some business in Water; but nothing noteworthy. Gas continued very firm, generally, on Thursday; though Buenos Ayres receded ½ more. Business was mostly in Brentford, Bahia, and Monte Video. Water was quite stagnant. Gas was quieter on Friday. South Metropolitan and Commercial debentures were rather better on *ex div.* adjustments. In Water, Lambeth and Southwark were similarly benefited; but the debentures of the former fell 1. Gas was very quiet on Saturday, though Bahia was still in demand. Gaslight "A" improved 2; and Commercial old, 1. Water was an absolute blank.

According to custom, we append a comparative table of the quotations of Gas and Water Stocks as at present and as they were six months ago. The most noticeable feature is the considerable advance in the value of the ordinary stocks of the three Metropolitan Gas Companies. Taking the list throughout, and setting the gains against the losses, a good general improvement in the position of gas securities is apparent. Among the Water Companies, the advances in price are largely in excess of the retrogressions. Strange to say, Kent, which to our way of thinking is one of the best of them, is the largest loser.

Name. GAS COMPANIES.	Prices on Dec. 31, 1888.	Prices on June 29, 1889.	Gain or Loss.
Alliance and Dublin, 10 per cent.	18½—19½	18—19	−½
Do. 7 per cent.	12½—13½	13—14	+½
Australian (Sydney) 5 per cent. Debentures	112—114	111—113	−1
Bahia, Limited	24—25	23—25	−½
Bombay, Limited	6½—7½	7—7½	+½
Do. New	5—5½	5—5½	—
Brentford Consolidated	223—228	229—234	+6
Do. New	164—168	167—172	+3½
Brighton and Hove, Original	43—45	43—45	—
British	43—45	45—47	+2
Bromley, Ordinary 10 per cent.	19—21	20—22	+1
Do. 7 per cent.	13—14	13½—14½	+½
Buenos Ayres (New), Limited	13½—14½	14½—15½	+1
Do. 6 per cent. Debentures	110—112	107—110	−2½
Cagliari, Limited	26—28	25—27	−1
Commercial, Old Stock	257—262	265—270	+8
Do. New do.	209—214	213—218	+4
Do. 4½ per cent. Debenture Stock	122—125	122—125	—
Continental Union, Limited	44—46	46—48	+2
Do New 1869 and 1872	30—32	32½—33½	+1½
Do. 7 per cent. Preference.	36—38	37—39	+1
Crystal Palace District	205—215	204—208	−4
European, Limited	25½—26½	25½—26½	—
Do. New	16—19	17½—18½	−½
Do. do.	12—13	12½—13½	+½
Gaslight and Coke, A, Ordinary	248—252	258—262	+10
Do. B, 4 per cent. maximum	100—105	100—105	—
Do. C, D, and E, 10 per cent. Preference	258—263	257—262	−1
Do. F, 5 per cent. Preference	125—130	123—128	−2
Do. G, 7½ per cent. Preference	182—187	182—187	—
Do. H, 7 per cent. maximum	167—172	165—170	−2
Do. J, 10 per cent. Preference	256—261	255—260	−1
Do. 4 per cent. Debenture Stock	117—120	117—120	—
Do. 4½ per cent. Debenture Stock	122—127	125—128	+2
Do. 6 per cent. Debenture Stock	170—175	170—173	−1
Imperial Continental	204—207	205—209	+1½
Malta and Mediterranean, Limited	5—5½	5—5½	—
Metropolitan of Melbourne 5 per cent. Debenture Stock	114—116	113—115	−1
Monte Video, Limited	19—20	19½—20½	+½
Oriental, Limited	9—9½	9½—9¾	+¼
Ottoman, Limited	6—7	6¼—6¾	—
Pará, Limited	5¼—6¼	5¾—6	+¼
People's Gas of Chicago, 1st Mtg. Bds.	104—107	103—107	−1
Do. 2nd Do.	93—97	96—100	+3½
San Paulo, Limited	15½—16½	16—17	+½
South Metropolitan, A Stock	297—302	317—322	+20
Do. B do.	232—236	235—240	+3½
Do. C do.	245—255	260—270	+15
Do. 5 per cent. Deb. Stk.	137—140	136—139	−1
Tottenham and Edmonton, Original	11—13	11—13	—

Name. WATER COMPANIES.	Prices on Dec. 31, 1888.	Prices on June 29, 1889.	Gain or Loss.
Chelsea, Ordinary	256—261	264—269	+8
East London, Ordinary	199—202	206—210	+7½
Grand Junction	121—125	120—124	−1
Kent	275—280	272—277	−3
Lambeth, 10 per cent. maximum	252—257	252—257	—
Do. 7½ per cent. maximum	197—202	200—208	+2
Do. 4 per cent. Debenture Stock	117—120	119—122	+2
New River, New Shares	350—360	350—355	+2½
Do. 4 per cent. Debenture Stock	123—127	125—129	+2½
Southwark and Vauxhall, 10 per cent. max.	166—171	172—175	+5
Do. 7½ per cent. maximum	158—163	163—168	+4
West Middlesex	261—265	261—265	—

ELECTRIC LIGHTING MEMORANDA.

THE BOARD OF TRADE MODEL ORDER FOR LONDON ELECTRIC LIGHT COMPANIES—THE PROCEEDINGS OF THE ELECTRICAL TRADES SECTION OF THE LONDON CHAMBER OF COMMERCE—THE REPORT OF THE LEEDS ELECTRIC LIGHT COMMITTEE.

The Board of Trade, as reported in last week's Journal, have drafted the Model Order which they propose to follow in granting statutory powers to the various London Electric Lighting Companies, and have submitted it to the County Council, who have appointed a Committee to consider the matter. The Order was accompanied by a printed memorandum explaining some of the contemplated regulations, and referring to the representations of the Council upon Major Marindin's report. In this statement it is laid down that the Order to the London Electric Supply Corporation—the Deptford scheme—will only be granted on condition of the provision of duplicate sets of generating machinery and mains. Regulations will also be issued to guard against danger to the public from the high-tension currents proposed to be employed by this Company. These conditions will go a long way towards raising to the level of the direct system the price at which the alternating current can be supplied. Orders granted will be revocable, wholly or in part, in case of default. Consumers are to be chargeable only for so much of their services as exceeds 60 feet in length from any distributing main; and all overhead wires are to be removed within two years. Piracy on the part of undertakers will be punishable by forfeiture. An important observation is made by the Board of Trade upon the claim by Metropolitan local authorities to be exempted from liability for damaging underground wires by steam-rollers and otherwise in carrying on the street repairs. It is stated to be the opinion of the Board that, "if any change is made in the present legal position, it should be dealt with by Parliament in a measure of general application." This is a good point, because there can be no doubt that, if the highway authorities had been allowed to damage underground electric wires with impunity, it would have been a step towards their emancipation from any necessity for being careful of buried gas and water pipes. Prices charged for electric supplies under the Orders are to be subject to revision after seven years; the minimum price for a supply is to be fixed at 13s. 4d. per quarter; and amalgamation of companies is made subject to the consent of the Board of Trade. The County Council is made the controlling authority, with power to appoint inspectors of lines and works, currents, and meters. In apportioning the areas of the different companies, the Board of Trade have generally followed the recommendations contained in Major Marindin's report. The Board claim for themselves and the County Council the credit for desiring to facilitate the working of the companies' undertakings under proper safeguard of the public interests; and the claim seems to be fairly justified.

The Electrical Trades Section of the London Chamber of Commerce has got into working order, as will be seen from a report in another column, and the Managing Committee have already taken upon themselves to issue "recommendations" to the Board of Trade and other authorities, quite in the approved fashion. Some of these recommendations appear to be reasonable enough; others are decidedly rash. Among others, it was thought desirable to obtain an alteration of the Board of Trade selling unit for electrical supplies, from 1000 to 10,000 watt-hours—thus in effect making the electrical equal the gas unit of 1000 cubic feet. This would not appear to us desirable from the point of view of an electrician; but, at any rate, the charge asked for by them will not be made. Another matter, which the Committee have had under their consideration, is the legal standard of light for photometrical purposes. They have come to the conclusion that the standard candle is not good enough for their purposes, and have petitioned the Board of Trade to take steps for replacing it with the pentane standard. The Chairman of the Section remarked that no reply to the suggestion had been received from the Board; and it is not very likely that when it comes it will be favourable. It was recognized, in the course of the proceedings at the recent meeting of the Section, that the Board of Trade are desirous of divesting themselves of all electric lighting business, and putting it into the hands of the County Councils. This prospect does not please the electricians at all; for, although they think the Board of Trade have been hard upon them in the past, they evidently dread what the more localized county authorities may do in the future. It must be a grateful surprise to the veiled Whitehall magnates to find themselves so esteemed by a class of men who, until lately, had not a good word to say for them.

Among the requirements of the electric lighting interest at the present time is a Government standardizing laboratory, where the various measuring and testing instruments employed in electrical

engineering might be certified. It is a greivance that, although Lord Rayleigh has proved the possibility of determining electrical units to within so small a fraction of error that uniformity may be said to have been secured, the instruments sold for testing purposes may and do vary considerably through the want in this country of a duly appointed standardizing department. There are such laboratories in Berlin and Paris; consequently German and French certified instruments for electrical measurement have an advantage over the English-made article which makers and users of the latter resent. This certainly seems a case for action by Government; for, if electrical supply by meter ever becomes a considerable business, it is eminently desirable that these instruments should be subject to the same kind of regulations as apply to gas-meters. It may be remarked, by the way, that little or no progress appears to be made in the way of producing an acceptable consumers' electricity meter. There are a variety of instruments so designated by their inventors; but they are all certainly very dear, whatever else may be said about them.

The Electric Lighting Committee of the Leeds Corporation have issued their report upon their past proceedings, and explained what can be done by way of extending the electric light in the town. In May, 1888, a grant of £10,000 was made to the Committee for carrying out an experimental system of electric lighting for the municipal buildings; and it is now made to appear that the amount actually expended for this purpose was £10,233, which is wonderfully close working for a Corporation Committee. With regard to the future, the report states that a subscription for 37,500 public and private lights could be obtained within a given area, to supply which would require an outlay of £58,000 for plant; but an additional £10,000 would be needed to extend the supply to private houses. To begin with, however, the Committee think they might make a fair show with £25,000. As to the cost of lighting, the Committee are of opinion that to supply a 10-candle power incandescent lamp need not run to more than ½d. per hour, including profit, but exclusive of depreciation and interest. We do not accuse the Committee of misrepresentation, but should like to know if this result has ever been achieved, and where; for this is distinctly the lowest estimate of the cost of incandescent electric lighting that has been promulgated on respectable authority.

THE VISIT OF MEMBERS OF THE GAS INSTITUTE TO PARIS.

THE correspondent who forwarded to us the account which appeared in last week's JOURNAL of the proceedings of the party of members of The Gas Institute who visited Paris at the close of the annual meeting in London in the previous week, has supplied us with the following additional particulars:—

Continuing my notes from the point at which they were left last week, the chief attraction on Saturday night was the illumination of the Exhibition grounds, especially the Eiffel Tower, and the public lighting of Paris generally. Here it may be remarked that in Paris not only festive illuminations, but the whole of the exterior lighting generally is carried out to an extent that would be regarded as much too extravagant in England. The lighting of the Place de la Concorde (the largest square in Europe), for example, may well be commended to the attention of local authorities having an economical turn of mind, and who consider their streets efficiently lighted when they have placed No. 4 burners some 50 to 70 yards apart. This highly effective piece of public lighting is accomplished by ordinary street lamps; but then there are enough of them. They are not laid out on the "darkness-visible" principle. An elegant arrangement of ordinary batswing burners in a circle, with a crystal annular basin beneath for regulating the air supply, and having a regenerative arrangement above, is extensively used. There are several different sizes, ranging from two up to six burners, and in each case the effect is so good as to at once attract the attention of a gas engineer. The glass is kept beautifully clean, and the burners in excellent order—there being a marked absence of defective burners, badly-shaped flames, &c.; and the columns are *columns*, artistically designed with base and capital, and not *posts*, as largely used in England.

But to return to the illuminations, all the principal buildings appear to have pipes, and in many cases devices, fixed permanently. So the amount of "illumination" that Paris could show at a moment's notice is very remarkable. A street stall of the kind that would have one or two glaring paraffin torches in this country, is there provided with a neat row of gas-lamps with opal globes, or of moderator oil-lamps. Whatever the form of light used—whether oil, gas, or electricity—the whole of the apparatus is in excellent cleanliness and order, to a degree far beyond that usual in England. This point will be particularly appreciated by those who visited the fair on the Avenue Neuilly, just outside the fortifications, which is held all through the month of June. It consists of stalls, shows, swings, roundabouts, &c., as common to an English fair, but all on a superior scale, arranged on each side of the avenue, and extending some two or three miles. Festoons of oil-lamps at frequent intervals, span the road throughout the whole distance. The services of all kinds of agents are called into requisition—gas-burners and oil-lamps being often in use at the same stall; and at one roundabout, constructed on a scale of splendour as yet undreamed of in this country, gas, oil, and electric light were all in use. Having noticed this, we are naturally prepared to expect something extraordinary at the exhibition; nor will the visitor be disappointed. The principal outlines of the Eiffel Tower, the buildings, and the flower-beds, are all marked out with gas-burners and opal globes. Lime-lights with coloured shutters and coloured fires are freely, though judiciously, used. There was a unanimous opinion as to the thorough success and splendour of this department. The outline of the tower, with its brilliant electric lights at the top, continually being diverted from one prominent object to another, is a striking sight from all parts of the city at night. Apart from the tower, however, the other illuminations are scarcely equal to those at South Kensington, in respect to fulness of outline, elegance of contour, and combinations of lights of various colours.

On Sunday the greater portion of the party availed themselves of the opportunity afforded for witnessing the celebration of mass at the various churches. Those who placed themselves under the guidance of Messrs. Gaze were first driven to the Church of St. Eustache, renowned for its great height, and for the number of chapels included in it, almost the whole surrounding of the interior being separated off in this manner. Thence they proceeded to the celebrated Cathedral of Notre Dame. After a hurried glance at the interior, such as is allowable during the procedure of worship, they were taken to the Place St. Sulpice, in order to witness an open-air celebration in the magnificent porch of the beautiful church dedicated to that saint. Leaving this, the next church visited was the Madeleine, which is built on the plan of an old Greek temple, being surrounded by a colonnade, and having at the back and front steps extending the whole width of the building. Here another outdoor celebration was witnessed, and an opportunity was afforded for inspecting the magnificent interior; but as this building, in common with the other churches, is open to visitors daily, the religious observances were the chief attraction for the time being. A notable feature of the churches in Paris is the insufficient lighting. The windows are few and small in proportion to the size of the building. The effect of the coloured glass is, of course, intensified; but the general result is somewhat depressing. This feature is especially noticeable in the Cathedral of Notre Dame.

The official outing of the Institute took place on Monday. The whole of the party assembled at Messrs. Gaze's office in the Rue Scribe, where commodious *chars-à-bancs* were in waiting at 10 a.m. Passing the exterior of the Bourse, which resembles the Church of the Madeleine in being built on the Greek Temple model, the first halt was made at the Halles Centrales. These represent Covent Garden, Smithfield, Leadenhall Market, and Billingsgate all combined in one place, if not under one roof. The excellence and cheapness of the fruit attracted attention—strawberries, cherries, &c., of beautiful quality, being offered at about one-fourth the price charged in London markets. The party proceeded to visit the Palais de Justice, or French Law Courts. These buildings surround a courtyard in which stands the interesting church known as Ste. Chapelle, which was built at a very early period of history for the purpose of receiving a few relics of the crucifixion that had been brought from the East. The richness of colouring and ornamentation, the coloured glass windows, gilt mouldings, &c., can scarcely be pourtrayed to those who have not seen the church; and it is remarkable that, although erected regardless of expense, the building cost less than one-third of the price paid for the relics that it was intended to receive. Joining the carriages again, the drive was continued to the Hôtel des Invalides, passing *en route* a ruined building formerly used as a public library, which was destroyed by the Communists in the year 1871, and is almost the only prominent remnant of the fearful work of devastation carried on at that time. A careful observer will find, however, many traces of the terrible scenes that have occurred from time to time in this apparently easy-going, pleasure-loving city, in the shape of new arms, toes, fingers, &c., skilfully adapted to the statuary, and little patches let into the stonework, in place of parts chipped by bullets. The principal feature at the Hôtel des Invalides is the magnificent gilt-domed mausoleum erected for the ashes of Napoleon I., and probably intended to serve for the whole Buonaparte family. Having inspected this building, the next trip conveyed the visitors to the Arc de Triomphe, considered to be the finest arch in the world. The ascent to the top of this structure, by means of a staircase included in the building—a feature that is not omitted from any of the Parisian arches—afforded an excellent view of the city; and here the party lingered until the flight of time rendered it necessary for them to proceed to keep their appointment at the Clichy Gas-Works at three o'clock.

On reaching the gas-works, which represent one of the ten stations belonging to the Paris Gas Company, the visitors found a party of about 100 gentlemen waiting their arrival, including M. Raoul Duval, President of the Company; M. Ellissen, Past-President of the Société Technique du Gaz en France; M. Cornuault, the President, and other members of the Committee; MM. Camus, Arson, Vallet, Hadamar, Ste.-Claire Deville, and other gentlemen connected with the Paris Gas Company. The usual courtesies having been exchanged, a tour of inspection was commenced. The works are situated on the banks of the Seine, at some little distance outside the fortifications, and are capable of producing, when in full operation, rather more than a million cubic feet per diem. The retort-houses are three in number, similar in size and design; each comprising five benches containing six beds of eight retorts, representing 240 double retorts in each house. The retorts are large in section, and are heated by regenerator furnaces on the Siemens system. The buildings are arranged end to end in a line at right angles to the river; and on one side is the coal-store, having an overhead railway, extending the whole length of the buildings, and railway service in connection with a large jetty situated on the

river bank. On the other side is the coke-yard, fitted with coke-crushing machines, and some very complete arrangements for the loading and delivery of coke to the customers. The coal is wheeled in from one side of the house, and the coke wheeled out at the other. The retorts are worked at ground level; excavations being made for the reception of the furnaces and regenerators. The hydraulic mains are very much larger in section than is usual in England; and the bridge-pipes are consequently of considerable length. The ascension, dip, and bridge pipes are straight, connected by elbow-pieces at right angles, and provided with cleaning doors; so that it would appear that choked pipes do not cause much trouble in Paris. From the hydraulic the gas passes to a collecting main carried round the inside of the retort-house, as usual in England; but after this an important difference comes in. The whole of the condensing, washing, exhausting, and purifying plant is composed of a number of sections—not less than six; so that the extent of apparatus in use can be proportioned to the make of gas. The same remark applies to station meters, of which there are ten. In the winter, the whole plant is in operation; and in the summer perhaps not more than two sections throughout. From the foul main the gas passes to the condensers (which are of the ordinary upright multiple-tube pattern, supplied with jets of water for cooling the exterior), and afterwards to the Pelouze and Audouin apparatus, where the remainder of the tar is extracted; and the gas is also washed with liquor. All the purifying apparatus, with the exception of the condensers, is housed in. The purifiers are small in section; and there are a large number of boxes, arranged in appropriate buildings, with sheds on either side for the reception of purifying material. The oxide is prepared on the works, according to the well-known system of treating solutions of copperas with lime. The copperas is dissolved in water; and the solution applied to sawdust spread out in a thin layer on the floor. When the sawdust is fully saturated, lime is added to it in quantity greater than that required to combine with the sulphuric acid of the copperas, and well mixed by means of shovels. No washers or scrubbers are used; but the first purifier in the series to which the foul gas is admitted does duty as an ammonia extractor—being charged with layers of moistened sawdust. This purifier is shut off at frequent intervals, and the sawdust is treated with water; the ammonia and other soluble impurities being thus washed out. There are seven gasholders of equal size at this works. They are comparatively small, being only single lift, and fitted with the peculiar arrangement of articulated inlet and outlet pipes that is a special feature in gasholders of French design.

Having completed a rapid inspection of the works, the company were invited into an unused department of one of the retort-houses, which had been improvised as a luncheon-room, and was elegantly decorated with evergreens and flags; a special feature amongst the latter being combinations of the English and French national colours. Here an elegant cold collation was served. After this, a short toast-list was gone through. M. Raoul Duval proposed the health of "The Queen," which was responded to with musical honours, and subsequently "Success to the Science of Civil Engineering," taking the opportunity to extend a hearty and cordial welcome to his English visitors. Unfortunately, neither the President nor any of the Vice-Presidents of the Institute was present to respond; but in their absence the pleasant task was ably discharged by Mr. Duxbury, as one of the Council. Mr. Duxbury also proposed "Success to the Compagnie Parisienne du Gaz;" and M. Duval, in replying, repeated his kindly and courteous welcome. Mr. Duxbury next proposed, "Prosperity to the Société Technique de l'Industrie du Gaz en France," coupling the name of the President, M. Cornuault, with the toast. This gentleman having replied, several of the English visitors, recognizing the genial countenance of M. Ellissen among their hosts, as that of the gentleman who so ably replied for the French gas managers at The Gas Institute meeting of 1888, called loudly for a few words from him. To this call he responded by proposing the health of the President of The Gas Institute, Mr. Garnett. This having been heartily received, and acknowledged by Mr. Duxbury, Alderman Miles next proposed, in happily-chosen language, "The Health of the President of the French Republic, M. Carnot;" to which toast M. Duval responded. The party then broke up; the English contingent being conveyed back to their respective hotels.

At nine o'clock in the evening, a reception was held at the Gas Pavilion in the Exhibition grounds. The visitors were received by M. Cornuault; and the whole of the building, including the laboratory and photometer-room, was thrown open for their inspection. Specimens of the "phonograph" and "graphophone" were exhibited in different rooms; and a high-class musical entertainment, including performers of various nationalities, was given in the great hall. It was rumoured that a congratulatory telegram had been received from the President of The Gas Institute, in response to one forwarded by Mr. Longworth in the course of the afternoon. But, through some oversight, Mr. Garnett's message, which would doubtless have afforded great satisfaction to all present, whether French or English, was not read out or made public in any way.

On Tuesday morning the party began to "thin out" by the departure of the first detachment to return home. But the majority proceeded to take another view of the exhibition; finding out various exhibits of special interest, such as specimens of retorts and fire-clay goods, coals, &c. A very large cylindrical tank of wrought iron—constructed for the purpose of acting as a store-tank for petroleum, but now adopted as a museum for the petroleum industry—contained specimens of boring-tools, testing apparatus, models of wells and their accessories, pictures, and drawings, together with a beautifully painted panoramic view (*à la* Niagara) of the petroleum districts of Pennsylvania; showing the oil-wells, refining-works, distilleries, store-tanks, &c.—the whole affording an idea of this industry that cou'd scarcely be acquired in any other way. Besides this tank, there was another building devoted to petroleum apparatus—such as lamps, stoves, and engines. The apparatus connected with electric lighting, to be found in various parts of the exhibition, was also critically examined; special attention being directed to the large machines to be seen in the machinery department, some of which are capable of supplying 2000 incandescent lamps. The visitors were amused by a picture included in the Edison exhibit. The centre-piece was the well-known factory at Menlo Park. The rays of a large "Edison" light suspended over this found their way to a number of views surrounding this centre-piece, which formed representative pictures of the principal countries of the world. England is ably represented in the machinery department by Messrs. Crossley's "Otto" gas-engine, the productions of the Leeds Forge Company, and many other exhibits.

Those members who could manage to do so, remained for a few days to visit the numerous interesting buildings and other attractions with which Paris abounds. The weather throughout was most favourable, and left nothing to be desired. A rather strong breeze, experienced during the course of the sea trip from Newhaven to Dieppe, should perhaps be excepted, as it caused a little inconvenience to some of the company. This, however, was only of a temporary nature. The whole of the visitors returned home well satisfied with their visit to Paris and the Exhibition, and gratified by the kindly attention extended to them by the Société Technique du Gaz and the Paris Gas Company.

THE SEWAGE WORKS AT KINGSTON.

After a long and costly struggle—including the various incidents of the late Sir Thomas Nelson's "Incredible Story," and all that relates to the departed Lower Thames Valley Main Drainage Board—the towns of Kingston-on-Thames, Surbiton, and Hampton Wick have solved the sewage problem for themselves by a species of contract with the Native Guano Company, and the consequent adoption of the A. B. C. process. The requisite works for the carrying out of this project have been constructed on the outskirts of Kingston-on-Thames, at a cost to the Corporation of that borough of about £23,000. A lease is granted to the Native Guano Company, together with a subsidy equal to a rate of 3d. in the pound per annum. The manure obtained by the process will be the property of the Company; the selling price being £3 10s. per ton. On Saturday the works were opened, when there was a large attendance of engineers and others interested in sanitary subjects; the visitors from town being conveyed by a special train. The parties who came together on the occasion were received at the works by the Chairman of the Native Guano Company (the Hon. W. F. B. Massey-Mainwaring), and the Directors, including Colonel the Hon. W. P. M. C. Talbot and Mr. W. C. Sillar. Among those who responded by their presence to the Company's invitation were General Sir Lintorn Simmons, General Baird, Sir John Heron Maxwell, General Sir Orfeur Cavanagh, Sir William Hardman, Captain Fairholme, Major Flower; the Mayors of certain boroughs, including Kingston, Cambridge, Margate, Portsmouth, and Worcester; and numerous officials. The Corporation of London and the London County Council were represented by several of their members. Dr. Tidy was present, as also Dr. Pankhurst; while among the engineers were Mr. Thomas Hawksley, Mr. G. L. Chatterton, Mr. Baldwin Latham, Mr. J. C. Melliss, Mr. E. K. Burstal, Mr. C. Hawksley, Mr. Isaac Shone, and Mr. A. G. Fenn.

The works are on a scale which readily adapts them for the treatment of the sewage of 40,000 persons; and very moderate additions would make them equal to a population of 50,000. The combined sewage of Kingston and Surbiton is now being treated; and that of Hampton Wick will shortly be brought in. A clause in the agreement between the Local Authorities and the Company provides payment for pumping the sewage, at a certain price per million gallons. For this purpose a meter has been invented by Mr. C. E. Robinson, the Company's Consulting Engineer, and forms part of the machinery on the works. When being used for measuring sewage, the meter can also be made available as a motor for actuating the machinery employed in feeding the chemicals required for effecting the A. B. C. process. The works, as they were seen on Saturday, had an appearance of great completeness; the only question that suggested itself being whether sewage could possibly be worth such elaborate and costly treatment. But the Native Guano Company have enjoyed the benefit of a very long experience in this matter; and it may be supposed that they knew how far "the game is worth the candle." In respect to the effluent, that which was shown on Saturday fully maintained the high character ascribed to the result obtained by this process at Crossness many years ago, when Mr. Keates reported upon it at the instance of the Metropolitan Board of Works. The contrast between the dark repulsive liquid which flowed from the mixing-house, and the clear stream which emerged from the precipitating-tanks, was very marked. The day was one of extreme heat, untempered by any breeze; and on that account was unfavourable to a sewage demonstration. But the general absence of any undesirable odour was remarkable, though at one point, where the effluent was much disturbed, a faint smell of

sewage might have been occasionally detected. This, however, was too slight to be perceptible at any distance. For the removal and treatment of the sludge, engineering skill had been exercised in no ordinary degree; the final result being the production of a drab-coloured powder—the famous "native guano" over which so much controversy arose in days gone by. The precipitating agents used in clarifying the sewage, and so producing the sludge, are much the same as in former days, except that the clay is less conspicuous—being partly superseded by charcoal. Alum is employed, as also a little blood; and so the three initial letters are maintained.

The visitors having expended an hour-and-a-half in examining the works, were afterwards entertained at a handsome luncheon provided in a large marquee—the Chairman of the Company presiding. Colonel the Hon. W. Talbot, in addressing the guests, quoted a passage in a report drawn up some time ago by Dr. Tidy and Professor Dewar, in which it was stated, as to the manurial value of the native guano, that it must be estimated rather by the practical results of the agriculturist than by presumed theoretical values based on analytical data, and on the price of ingredients not necessarily in the same physical or chemical condition. The Mayor of Kingston, who followed, spoke of the anxiety and trouble which the Local Authorities had endured during the last 25 years with regard to the sewage question. Large sums of money had been wasted; the loss experienced by his own borough having been more than sufficient to pay for these works. After all, they could only find one system which met their requirements, and that was the one they now saw in operation. The expense amounted to a rate of 1½d. in the pound, for buildings and works, and 3d. for the treatment of the sewage. The land was the property of the Corporation. The Chairman, in one of his speeches, made reference to the Metropolitan sewage; stating that the Company were as ready to undertake its treatment now as when they made their offer to the Metropolitan Board many years ago. The London sewage was a hundred times greater in volume than the sewage for which these works had been erected; but it would not be necessary to have works a hundred times greater than these in order to deal with the sewage of London. On the other hand, if the sewage of the Metropolis was to be disposed of by irrigation, they would require the whole county of Kent for the purpose. His Company, in treating the entire sewage of London, would produce 200,000 tons of native guano per annum; being a fair dressing for less than half the county of Kent.

After some other addresses, a striking speech was made by Mr. T. Hawksley, in responding to the toast of "The Institution of Civil Engineers." Mr. Hawksley stated that for the space of 40 years he had been much interested in sanitary subjects. Numerous proposals had been made for the treatment of sewage; but, while opinions differed, the practical results tended to the adoption of a process more or less resembling the A. B. C. He had been over the Kingston works that day for the first time; and he must say that he had been agreeably surprised by what he had witnessed. He had seen sewage changed into a bright and unobjectionable effluent, and he understood that the Company undertook to do this at a charge equal to a rate of 3d. in the pound. According to his somewhat large experience in this matter, such a charge was only one-third or one-fourth of what was paid to get rid of the sewage nuisance in other towns. He had very much faith in the Company; and he hoped that, by the production of a saleable manure, they would be able to obtain a reasonable return for their invested capital.

The proceedings shortly afterwards terminated; a complimentary vote being presented to the Chairman and Directors of the Company, as proposed by General Sir Lintorn Simmons.

What is said to be the eightieth gas-works erected in Spain has just been opened at Avenys Mar, in the Province of Barcelona.

Mr. H. Herbert Jones, son of Mr. H. E. Jones, M. Inst. C.E., Engineer of the Commercial Gas Company, has been appointed Assistant-Manager of the Bombay Gas Company.

The Jury for Class 27 (Heating and Lighting Appliances) at the Paris Exhibition is composed of the following gentlemen:—MM. Beau, Cornuault, Gronville, Lacarrière, and Luchair, with MM. Chabrié and Piet as auxiliary members.

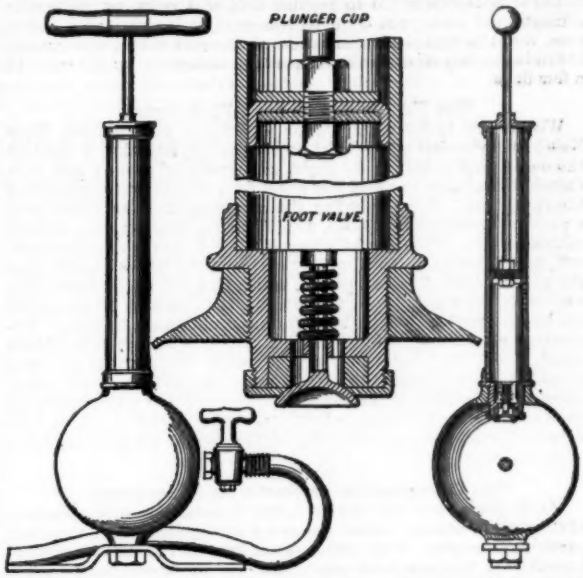
At last Tuesday's meeting of the London County Council, it was reported that one of the members of the Water Committee (Mr. B. L. Cohen) has resigned his seat on the Committee. As it was considered desirable to strengthen the Committee, it was decided to add the following gentlemen:—Mr. H. Clark, Mr. A. J. Hollington, Mr. T. W. Maule, Mr. W. Phillips, Mr. N. Robinson, and Captain J. Sinclair.

At the Royal Agricultural Society's Show at Windsor, the Pulsometer Engineering Company, Limited, had an effective display of their pumping appliances at Stand 352. An attractive feature was a huge Pulsometer steam-pump slung on poles, to show the method of using it in sinking operations. With the aid of a boiler and steam-pipe, this pump will lift 80,000 gallons of water per hour to a considerable height. The Company also showed their well-known "Deane" and duplex pumps, and their regenerative ice-making machine; also the "Sirenette"—an instrument for producing a uniform sound audible at long distances, and suitable for signalling purposes, for which it is used by the Admiralty.

Notes.

Fiddes and Stagg's Patent Service Cleanser.

In the accompanying illustration is shown a service cleanser which has been patented by Messrs. Fiddes and Stagg, and the manufacture of which has been undertaken by Messrs. W. and B. Cowan. The invention consists in adopting a leather cup as a plunger. When the plunger is being drawn up, the supply of air passes down between the cup and the tube; and on the cup being forced down to charge the bulb, the pressure closes the cup against the tube,



and the air is forced into the receiver, whence its return is arrested by a valve, so constructed as to be absolutely air-tight under all the general conditions of grit settlements between the valve-disc and its seating. The ordinary valve in the plunger is thus dispensed with; and the air in passing the leather is practically filtered before it reaches the valve beneath. A very high and permanent pressure can thus be attained. The valve and the application of the leather cup in the simple form described are distinct novelties. The cleanser can also, we believe, be used for the injection of liquids.

The "Free Carbon" in Coal Tar.

In a recent number of the *Journal für Gasbeleuchtung*, Dr. H. Köhler published some interesting results of investigations which he has been conducting in connection with the above subject. The following is an epitome of his conclusions. The so-called "free carbon" is left insoluble when gas tar is extracted with solvents. It contains carbon, hydrogen, and ash, and appears to arise from the carbonization of the higher hydrocarbons at elevated temperatures, with the admixture of small quantities of coal dust drawn into the hydraulic main by the exhausters. It is formed in greatest quantities when the production of the gas-works is at its maximum. Hence in winter more is produced than in summer, and in large works more than in small ones. Numerous experimental determinations show that the tars containing most "free carbon" have higher specific gravities, are more viscid, and yield heavier hydrocarbons and oils than those containing smaller quantities. Moreover, it is shown that the boiling-over of tar during distillation is principally due to "free carbon," and not so much as is supposed to the water present. Another objectionable character of the "free carbon" is that when the pitch, for safety against catching fire, is allowed to cool, even for a few hours, the "free carbon," or at least some of it, sinks to the bottom and is left behind, when the pitch is run off. This does not dissolve in any fresh charge of tar, but remains and burns at the bottom; forming a crust as destructive to the retort as boiler incrustation is to boilers. Finally, it is suggested that the quality of a tar may, to a certain extent, be ascertained by estimating the amount of "free carbon" in it. A tar which has a small quantity of "free carbon" may not always be good; but one containing a great deal is undoubtedly bad.

A New Test For Cement.

A new method of testing cement has been practised by Herr Böhme, and is described in a German technical journal. Experiments were made with ten samples of cement, in order to ascertain, first, their general properties; secondly, their tensile and compression strength; and, thirdly, their power of resisting wear on the surface or attrition. Some of the cement was mixed with normal sand, and during the 7 and 28 days that the briquettes were left to harden, some of them were exposed for part of the time to a temperature of −12° to −15° C. Tests were made of pure cement, and of mixtures of 1 part by weight to 1, 2, 3, and 4 parts by weight of sand; all the specimen briquettes being exposed at first to moist air, then dried in air for 24 hours, then plunged into

water, next air-dried again, and then frozen at a temperature of —12° to —15° C. They were afterwards placed in water at 18° C. for four hours, frozen again for twenty hours, thawed once more for four hours, and left under water for the rest of their period of hardening. The surface attrition to which they were subjected was obtained by the use of a revolving iron plate supplied with a determined quantity of emery powder, loaded with a constant weight, and run for a given number of revolutions. The results are stated in very lengthy tables, and point to the general conclusions that the chief effect of exposure to frost is to retard the setting of the cement, causing it to remain soft, and reducing its tensile strength and resistance to compression. It is considered, however, that this retardation has little permanent effect; the cement becoming nearly equal to the unfrozen specimens after the lapse of a few days.

The Use of the Bunsen Photometer.

With regard to the manipulation of Bunsen photometers, Herr Nebel remarks that when light enters the eye laterally, it renders the organ less sensitive to slight differences of shade; and it is therefore desirable to avoid this effect by a suitable arrangement of the apparatus. For producing the grease-spot, Herr Nebel uses a perfectly rounded brass disc, 20 millimetres in diameter, provided with a handle. This disc is warmed, dipped into molten spermaceti, and (after the removal of any excess of the latter) placed upon the paper intended to be spotted, which is 0·061 millimetre thick, and stretched evenly on a flat board. The corners of the paper are best secured with little brass frames and Canada balsam. Remarking upon the fact that the visual power of both eyes is seldom equal, Herr Nebel states that photometrists who get into the way of taking observations of the photometer just as they would use a stereoscope, looking at the reflected images of the paper screen at once and with both eyes, are liable to make mistakes. It is best to use only one eye for both sides of the disc in all photometrical observations.

The Condensation of Smoke by Electricity.

Mr. R. Irvine has contributed to the Transactions of the Society of Chemical Industry a short paper on the condensation of carbon particles in smoke. The author states that in the manufacture of lamp-black, hydrocarbons are burnt in an atmosphere with a limited supply of carbon. The resulting thick black smoke is conducted into large chambers, where, on account of the extremely sluggish draught, it is allowed to roll about until the particles gradually coalesce by mutual attraction into masses, which, after a lengthy period, fall on the floor in the form of soot. This process is extremely slow; and the product obtained is comparatively small even from an enormous condensing space. Following the lead of Professor Lodge in his striking experiments upon lead stythe, Mr. Irvine, with the assistance of Mr. J. Lillie Mitchell, undertook a series of experiments with a view to expediting the process of condensing carbon out of smoke. For this purpose a glass structure 5 feet by 4 feet by 4 feet was erected, in which were fixed two malleable-iron plates, provided with a great number of points facing each other, and separated by a distance of from 2 to 3 feet. All the conducting surfaces except these points were carefully insulated with shellac varnish. The chamber was filled with smoke produced from burning pitch oil, which retained its opacity for at least two hours; so that after this time a bright light placed on one side of the chamber could not be seen from the other side. The chamber was then refilled once more with thick black smoke, and the whole atmosphere was to a greater or less degree electrified by coupling to a small dynamo the conductors which were attached to the plates. The effect immediately produced was exceedingly striking. Minute particles of carbon at once separated from the opaque smoke, and were attracted to or driven from the points of the plates; congregating together in a very remarkable manner. In the space of two or three minutes the atmosphere in the glass chamber was almost entirely cleared of smoke. Unfortunately for the hope that might be entertained of getting rid of all smoke and fog by some such means, the cost of electricity has prevented the practical application of Mr. Irvine's process in the manufacture of lamp-black.

Testing Spent Substances from Gas Purification.

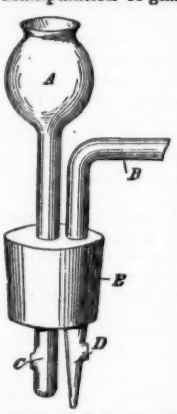
Writing in a recent number of the *Journal für Gasbeleuchtung* Herr C. Moldenhauer and Herr W. Leybold describe a new method of determining the Prussian blue in the spent material of gas-works purifiers, in substitution for Knublauch's system, which though very generally used in Germany is not entirely satisfactory, seeing that the end of the titration is often uncertain. According to the proposed new process 50 grains of the spent substance are placed in a flask with 100 cc. of a solution of 10 per cent. caustic soda and 2 per cent. sodium carbonate; and heat is applied to hasten the decomposition. The whole is then diluted to 1030 cc.; and 100 cc. of the filtrate are evaporated down in a platinum or porcelain basin, and treated with 25 cc. of dilute sulphuric acid (10 per cent.). After further evaporation, the excess of acid is driven off, and the organic matter destroyed by ignition. The yellow residue consists of ferric sulphate and sodium sulphate, which is dissolved in dilute sulphuric acid. The iron is reduced tothe ferr ous state by means of zinc, and titrated with permanganate solution. From the iron thus found the amount of Prussian blue is calculated. A blank experiment should, say the authors, be made to ascertain the slight correction necessary for impurities in the zinc. It is stated that concordant results were obtained by several chemists working independently with the process.

Communicated Article.

A SIMPLE FORM OF DISTILLATION FLASK FOR THE VALUATION OF GAS LIQUOR.

By H. Leicester Greville, F.I.C., F.C.S., &c.

The valuation of gas liquor by the estimation of the total ammonia present by distillation with an alkali, in preference to the older method of valuation by the acid test, is now so universally recognized as the only correct method, that any advocacy on my part would be a work of supererogation. I have for some time past used a simple form of distillation flask, a description of which may possibly be of interest to your readers. In the ordinary form, a flask of the requisite size is fitted with a cork or caoutchouc stopper provided with two holes. Through the one passes a tube funnel with stopcock for the admission of liquor solution of alkali, &c., to the flask; while the other is used for the passage of a tube as an outlet for the ammoniacal vapours into the measured quantity of test acid. There is perhaps no forcible objection to this form of apparatus. But there exists no ready means of testing the evolved vapours, in order to definitely ascertain the completion of the distillation; and the stoppered funnels, costing 2s. 6d. each, are apt to become useless through the setting of the taps. My contrivance (shown in the illustration) can be easily blown by any one having a slight acquaintance with the manipulation of glass. Those not possessing the necessary skill, or not caring to take the trouble, can purchase it for a reasonable price of Messrs. Townson and Mercer, of Bishopsgate Street. I have, for the sake of simplicity, omitted the flask in the sketch. E is a caoutchouc stopper, tightly fitting the mouth of the flask. It is perforated with two holes, one of which takes the funnel tube A, while the other takes the outlet-tube B. The outlet tube B is drawn out at its lowermost extremity, and has a side hole at D. This is for the purpose of preventing any fixed alkali during the boiling of the flask being carried over mechanically. The ammoniacal vapour enters at D; and the less volatile portion condenses in the upper part of tube, and drips back into the flask. The funnel tube A is sealed at the bottom, but has a hole blown in the side at C. In the position shown in the diagram, it is obvious that the charge of liquor, the solution of alkali, and the requisite quantity of distilled water can be poured into the funnel, and will pass through into the flask. This being done, the funnel is pulled up through the caoutchouc stopper, until the hole C is sealed. The distillation can then be made; and when it is considered necessary to ascertain whether the process is complete, a momentary depression of A, so as to permit the steam to pass through the orifice C, and thus to escape up the funnel, allows of a ready test being made with delicate litmus paper. I have used this appliance with satisfactory results for some months; and a caoutchouc stopper, if a good fit in the first instance, will last some hundreds of times.



While on the subject of gas-liquor testing, there is no doubt that, while the distillation test is the only just method of valuation between buyer and seller, the ordinary acid test will be used for a long time to come, as a practical working guide for speedily ascertaining the strength of the liquors produced at different portions of the plant. In using this test it may not be generally known to gas managers that the ordinary litmus paper may be advantageously dispensed with in favour of a solution of "methyl-orange"—a colour re-agent indifferent to carbonic acid and sulphuretted hydrogen, and which can be thus used for the direct titration of gas liquor. A convenient strength is 10 grains to the pint. The liquor to be tested is measured into a white porcelain basin, sufficient methyl-orange solution added to produce a distinct and well-marked colour, and the test acid run in with continued stirring until the orange colour changes to pink. The following series of tests show that this method gives almost identical results with the ordinary litmus paper method; and it is certainly more speedy and reliable:—

	Strength by Litmus Paper Test.		Strength by Methyl-Orange Test.
Scrubber liquor.	1·52 oz.	..	1·50 oz.
Scrubber	13·0 „	..	13·0 „
Tar well	8·5 „	..	8·45 „
Stock	9·1 „	..	9·05 „
Do.	8·65 „	..	8·6 „
Do.	9·3 „	..	9·2 „

The City Commissioners of Sewers and their Artesian Well.—At a recent meeting of the Commissioners of Sewers the Streets Committee reported on the termination of the contract, with Messrs. Hills and Co. for making the artesian well in Whitechapel. It appeared that Messrs. Smith and Campbell were the guarantors under the contract with Messrs. Hills and Co.; the amount being £1750. The guarantors had already sustained a loss exceeding £2000 in respect of the contract; and it was estimated that the cost of completing would be £1360, and the time required eight months. Messrs. Gilley and Sons having agreed to complete the well on behalf of the guarantors, the Committee recommended that the latter be allowed to take over the contract.

Register of Patents.

PURIFYING OR TREATING COAL GAS AND OTHER GASEOUS OR LIQUID PRODUCTS OF DESTRUCTIVE DISTILLATION.—Campbell, A., of Upton Park, Essex, and Boyd, W., of Glasgow. No. 10,186; July 13, 1888. [6d.]

This invention, which relates principally to the purification or treatment of coal gas and other gaseous or liquid products of destructive distillation, has for its objects (1) the more complete removal of sulphuretted hydrogen or polysulphides; (2) the more complete removal of all other volatile sulphur compounds; (3) the removal of carbonic acid entirely or to a considerable extent; (4) the separation of the whole of the volatile ammonia as carbonate or sulphate or both; (5) the separation of the fixed ammonia in a concentrated form and chiefly as sulphocyanide.

In carrying out the invention, in the case of coal gas, after leaving the condenser it is passed through a tar separator, a vertical scrubber, or a mechanical washer supplied with condenser liquor, and the water from the hydraulic main, in order to remove as completely as possible all tarry matters present in the gas in a vesicular condition. The water is continually returned until it acquires a considerable density; and after removal it is treated as hereafter described. The gas is next passed through one or more scrubbers or washers, down which are passing streams of a mixture of the watery liquor previously separated and artificial peroxide of manganese in a state of very fine division. The peroxide of manganese will separate sulphuretted hydrogen or polysulphides from the gas; but it must in practice be considerably in excess of the quantity theoretically required for the purpose. When the peroxide of manganese is in sufficient excess, little or no carbonate of manganese is formed; and the mud produced readily absorbs oxygen from the air. The manganese mud which has acted on the gas is then run into a close well, in which it may settle.

The settled mud, or the whole of the muddy liquor, is next pumped into an oxidizer or oxidizers such as are used in the Weldon manganese regenerating process; and a stream of air is continuously pumped through the mixture, and re-oxidizes the manganese which has been reduced by the sulphuretted hydrogen. The supply of the mixture may be continuous; it being maintained at a constant level in the oxidizers, and a stream equal to the supply running out continuously from them. The oxidizing process is conducted at a temperature of from 120° to 140° Fahr.; and during its operation considerable quantities of ammonia and carbonic acid are expelled—the acid being usually in the proportion of four equivalents of it to one of the ammonia. These gases are either conveyed to a scrubber or washer in which a solution of carbonate of ammonia is obtained, or they may be passed at once into a solution of sulphate of manganese—sulphate of ammonia and carbonate of manganese being produced. After separating the carbonate of manganese which is precipitated, the solution may be concentrated; and, being by preference slightly acidified, will yield a very pure sulphate of ammonia, whilst the carbonate of manganese on being heated in a current of heated air will be more or less completely converted into peroxide of manganese.

If the manganese mud is separated from the liquid before oxidizing it, it is necessary to heat the liquid to a temperature between 140° and 180° Fahr. in a closed vessel, with mechanical agitation, or with agitation by a current of air from the oxidizers. This treatment splits up the carbonate of ammonia in solution; and the carbonic acid escapes along with a small portion of the ammonia. The ammonia remaining in the solution is to a large extent in the free state; and after cooling again, is available for removing carbonic acid from the gas. The processes can be arranged so that most of the carbonic acid can be removed from the gas by means of ammonia; whilst any remaining traces may be got rid of by passing the gas finally through lime purifiers.

The re-oxidized manganese mud, after being cooled, is again run through the gas-purifying scrubbers, to effect the removal of further quantities of sulphur. The mud becomes highly charged with sulphur in a state of fine division; and, as is well known, free sulphur in a solution of ammonia exercises a powerful influence in removing bisulphide of carbon from coal gas. The result is that the bisulphide of carbon is very completely removed in the form of sulphocarbonates and sulphocyanides of ammonium.

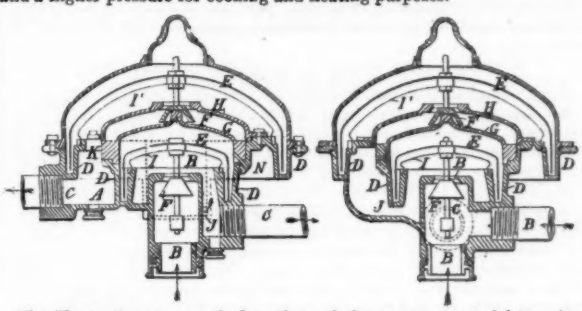
The sulphur, when sufficiently accumulated in the manganese mud, may be separated in various ways. According to one plan, the mixture is run into a closed vessel, and is boiled to expel free ammonia. When all the ammonia has been expelled, the steam outlets are closed; and the mixture is subjected to a pressure of between 30 and 40 lbs. per square inch—the temperature being high enough to melt the sulphur. When the proportion of sulphur present is not enough for it to run together when melted, the boiled mixture may be pressed into cakes, and the manganese may be dissolved out with acid; leaving the sulphur as a nearly pure mud, which may be readily and completely melted in a closed vessel. Or the pressed cakes may be immersed in a solution of chloride of calcium or other suitable salt boiling at a higher temperature than that at which sulphur melts. In such a solution the sulphur will freely melt and run together, and can be drawn off at intervals. The manganese mud is afterwards washed free from the salt, and then reintroduced into the cycle of operations.

The liquid associated with the manganese mud, and which continuously circulates the various parts of the apparatus, will gradually increase in density by the accumulation of fixed salts of ammonium (chiefly the sulphocyanide), and for the purpose of obtaining such salts, portions of the liquid are periodically taken out of circulation. It will generally be found that the quantity of water in circulation increases; but if any requires to be added, it is preferred for it to be in the form of steam or water condensed from steam, in order to keep the liquid as free as possible from sulphates, chlorides, and other objectionable salts, and so that a solution will be obtained containing almost exclusively pure sulphocyanide of ammonium. The patentees believe it to be practically possible by this process to obtain from gas liquors, at once and directly, the valuable salt sulphocyanide of ammonium, by filtration, evaporation, and crystallization.

In dealing with ammoniacal liquor as at present obtained from gas-works, coke-ovens, blast furnaces, shale-works, and similar sources, the ammoniacal liquor is mixed with peroxide of manganese to remove sulphuretted hydrogen, or the ammonia and steam are distilled and passed into a scrubber through which peroxide of maganese is passed; and then if sulphate of ammonia is to be made, pass it into a solution of sulphate of manganese. The uncondensable gases, which are at present burned under retorts or in furnaces, may be treated in a manganese scrubber, to remove sulphur and other impurities, as in the treatment of coal gas already described; and any ammonia in such gases and which is now lost, may also be collected.

GAS REGULATORS OR GOVERNORS.—Sugg, W. T., of Vincent Street, Westminster. No. 10,242; July 14, 1888. [8d.]

This invention refers to an arrangement of mercurial gas-governor, for controlling simultaneously a low pressure of gas for lighting purposes, and a higher pressure for cooking and heating purposes.



The illustrations are vertical sections of the governor, at right angles to each other.

The casing of the governor has a central inlet opening B, and two lateral outlet openings C, with which the service-pipes are connected. It is also formed with two annular concentric troughs D, for the mercury to seal the domes E, which carry conical valves F in the usual manner. The inner and smaller dome forms the high-pressure regulator; and the larger and outer dome E the low-pressure regulator. Above the lower dome is a cover G, with a central lump, which forms a rest for the valve of the upper dome. This cover, so to speak, divides the two governors. Above the cover is secured a second cover H, in which is the seat for the upper valve. To prevent the escape of the mercury when the governor is placed on its side, there is secured, by rings or otherwise, to the upper edge of the inner wall of each trough D, a diaphragm of leather I, which may be also attached at its centre to the crown of its dome. The gas enters under the high-pressure governor at B, and passes partly by the passage C to the high-pressure service-pipe, and partly by a passage J to the space between the two covers G and H; thence, by an opening K, to the low-pressure service-pipe. The whole governor will be closed in by a suitable cover, in which is a small orifice for the entrance of the external air, with a similar orifice for the lower governor. Springs or weights are provided above the domes, to regulate the pressure at which the governors work, in the usual manner.

REGULATING THE SUPPLY OF GAS TO ENGINES.—Williams, H., of Stockport. No. 10,462; July 19, 1888. [8d.]

This invention relates to that arrangement of mechanism for regulating the supply of gas to motor engines in which the slide admission valve is opened by a finger connected to the governor and mounted on a vibrating lever operated from an eccentric on the crank-shaft. In such an arrangement, when the engine has considerably exceeded its normal speed, the governor acts to withdraw the finger, and leave the slide-valve closed (say) for one stroke; whereby no gas or other fluid is admitted until the governor moves the finger back into position to again actuate the slide-valve. The present object is to render the governing mechanism more sensitive in its action, so that it will pass more or less gas as required, instead of either admitting a full charge, or else entirely shutting off the admission of gas.

To accomplish this object the usual straight plate or projecting portion of the slide-valve which ordinarily constitutes the striking surface for the finger is dispensed with; and instead an inclined surface is formed with a number of ratchet teeth cut upon it, into one of which the finger enters to move and open the valve. According as the position of the finger is varied by the governor, and the finger engages a tooth either nearer to or farther from the foot of the incline, so does the traverse of the slide-valve vary to admit more or less gas or other fluid to the engine as required.

GAS MOTORS.—Boult, A. J.; a communication from J. Larrivee and A. Aengenheyster, of Paris. No. 13,414; Sept. 17, 1888. [8d.]

This invention relates to a gas motor consisting essentially of three principal parts—*i.e.*, an outer cylinder, an inner cylinder, and a wing or fan. The working of the motor depends on two cranks, one of which describes an entire revolution with the fly-wheel, while the other never goes over the horizontal line. This motion produces or controls the oscillating movement of the wing, and limits its movement to within one-half of the circumference of the cylinder.

The patentee proposes on a suitable frame to fix a half cylinder with double walls, leaving between them a chamber for the circulation of cold water for the purpose of cooling the parts of the motor. In the interior of this half cylinder is mounted on a shaft a second cylinder, to the surface of which is fixed a wing or fan fitting exactly in the interior of the outer cylinder, and moving with the inner one. This wing or fan (so to speak) replaces the piston used in other motors. In the base of the outer or half cylinder is formed an opening for the entrance of atmospheric air for the cooling of the inner cylinder. To the shaft of the inner cylinder is fixed a crank, upon the pin of which works one end of a connecting-rod, the other end of which works upon the pin of a crank fixed to the shaft of the fly-wheel. By means of these two connected cranks, the oscillating movement of the inner cylinder with the wing fixed thereto is imparted or controlled. The introduction of the gas is regulated by bevel gearing in a chamber or box mounted on one side of

the outer cylinder. This box is formed with (preferably) seven holes, the central one of which communicates with the gas supply-pipe, while the surrounding six are for the introduction of the necessary atmospheric air drawn in by the movement of the wing of the inner cylinder. On one of the sides of the chamber is mounted a valve (of sufficient size for the escape of the products of combustion) worked by an eccentric roller fastened to a shaft, which is operated by a horizontal shaft provided at each end with a bevel pinion, one of which gears with a bevel pinion mounted on the shaft of the fly-wheel, while the other gears with a bevel pinion mounted on the shaft or rod operating the valve. When by the suction of the wing piston a sufficient quantity of gas and air is introduced in the outer cylinder, the valve of the gas chamber is closed, and the piston wing compresses the explosive mixture in its return stroke. When the mixture is sufficiently compressed, it is fired by an electric spark, and drives the wing sharply back; the valve for the escape of the products of combustion opening, and the wing piston sucking in a fresh quantity of explosive mixture.

GAS MOTOR ENGINES.—Nelson, A. S., of Stirling, and M'Millan, J. G., of Kilwinning, N.B. No. 5397; March 29, 1889. [8d.]

This invention relates to improvements in gas motor engines; the improvements referring mainly to the governor and valve arrangements, whereby suitable apportionment of the gas and air forming the combustible charge or mixture supplied to the cylinder is effected in order to secure the maximum of efficiency and economy.

STOP INDICES FOR PREPAYMENT GAS-METERS.—Valon, W. A. M'I., of Ramsgate. No. 6431; April 12, 1889.

The object of this invention is to so construct gas-meter indices that, immediately after a certain desired quantity of gas has passed through the meter, the index (and consequently the meter) will stop, and the supply of gas be cut off.

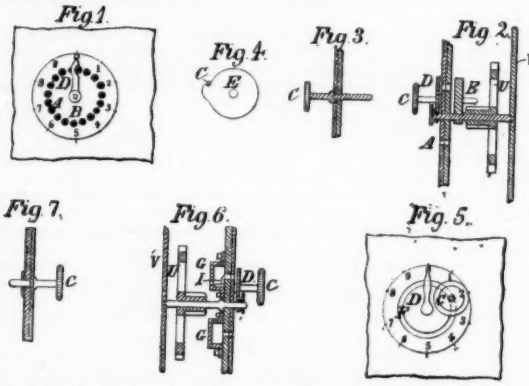


Fig. 1 is a front elevation of the meter dial marking hundreds; fig. 2 is a vertical sectional elevation through fig. 1. Fig. 3 is a section of the pin employed; and fig. 4 is a cam to be further alluded to. The remaining figures refer to one of the various modifications described.

To carry out this invention, the patentee proposes to make holes A within the circle on the dial plate B marking hundreds; and into any of the holes there is thrust a milled or other suitably headed pin C having a shoulder only sufficiently long to pass through the dial plate and project considerably beyond. When the index or pointer D of the hundreds dial has made either a whole or any desired part of a revolution, it will press against the pin C and so prevent the wheels of the index revolving—thus stopping the meter and cutting off the supply of gas. In order to make the action more certain, the spindle or arbor that carries the pointer has, on the inside of the index, an arm or disc E (fig. 2), with a projection or cam as seen in fig. 4, which comes into contact with the part of the pin projecting on the inside. The stopping of the meter is thus additionally secured. Instead of plain holes in the dial plate, they may be screwed; and the pin may be correspondingly screwed—thus doing away with the necessity for using the arm or disc E.

One modification of the foregoing may be carried out by making a concentric slit F (fig. 5) within the circle of the hundreds dial; the inner and outer part of the discs being connected together by straps G, or a plate behind the dial plate and on the inside of the index. A milled or suitably headed screw C (figs. 5, 6, and 7) with a shoulder, is passed through the slit, and enters the nut I so shaped or arranged that it will not turn on revolving the screw. The screw pin C may, therefore, be fixed at any part of the concentric slit; and when the hand or pointer comes in contact with it, the meter will stop.

APPLICATIONS FOR LETTERS PATENT.

9916.—LEVY, A. M., "Improvements in carburettors or apparatus for enriching or producing gas." June 17.

9922.—KEMBLE, W., "Improved means and appliances for extracting carbon from the cylinders of gas-engines." June 17.

9956.—ARMITAGE, C., "Improvements in means for revivifying the agents used in the purification of coal gas." June 17.

9964.—RIGNAULT, C., "Improvements in pipes for conducting water." June 17.

9968.—STEINHILBER, A., "Extinguishing gas." June 17.

9972.—NEWNHAM, J., "An improved apparatus for the governing and registering of gas, water, and other fluids." June 17.

10,007.—DAIMLER, G., "Improvements in gas and petroleum motor engines." June 18.

10,050.—CASSON, R. S., "An improvement in regenerative gas-furnaces." June 18.

10,089.—CRADDOCK, T., "Improvements in combustible liquid and gas burners." June 20.

10,164.—CROOKES, W., RICARDE-SEAVER, F. I., "Improvements in the treatment of water gas." June 21.

Parliamentary Intelligence.

HOUSE OF LORDS.

The following further progress was made with Bills during the past week:—

Bills committed: East Kent District Water Bill, Garw Water Bill, Gas and Water Orders Confirmation Bill (Marlow Order), Swansea Corporation Bill.

Bill reported: Liverpool Corporation Bill.

Bills read the third time and passed: Newry Improvement Bill, Stapleford and Sandiacre Water Bill.

Bills Royal Assented: Coventry Corporation Water Bill, Great Wigston Gas Bill, Manchester Corporation Bill, Morley Gas Bill, Newcastle and Gateshead Water Bill, Tuscan Gas Bill.

Petitions were presented against the following Bills:—

Garw Water Bill, from the Earl of Dunraven and Mount-Earl, the Bridgend Gas and Water Company, the Ogmore and Garw Local Board, and certain colliery owners.

Swansea Corporation Bill, from the Swansea Rural Sanitary Authority.

HOUSE OF COMMONS.

MONDAY, JUNE 24.

STOKERS IN THE ROYAL ARSENAL GAS-WORKS.

MR. CUNINGHAME GRAHAM asked the Secretary of State for War whether he was aware that the stokers in the Royal Arsenal Gas Factory work on an average 81 hours per week, and receive pay at the rate of 5d. an hour, whether in the day or night; that they had to wheel their coke in the open air for a distance of 50 yards in all weather, while in a very high state of perspiration; that the lobby in which the men have to change their clothes and take their meals has an open cesspool in the corner, is insufficiently ventilated, and often filled with sulphurous fumes; and whether he would take steps to reduce the hours that the men have to work at this exhausting labour to eight per day, to have a covered way erected for their protection when wheeling, and to have a new and properly erected lobby built wherein the men can take their meals.

Mr. E. STANHOPE: The stokers in the gas factory are paid for twelve hours a day for six days a week, which includes time for meals and resting between the draws or heats. Their hours do not exceed those of the ordnance factories generally. The coke has to be wheeled some 30 to 50 yards in the open air, but not necessarily when the men are in a high state of perspiration. A covered way would be useless, as the coke has to be spread over a wide area. There is no cesspool in the lobby referred to, and it is fairly ventilated; but, being close to the retorts and purifiers, the smell from the gas-works occasionally enters. I am informed that a reduction in the hours of labour would be against the custom of the trade, and that it would be resented by the men at the present rate of wages.

THE COMMITTEE ON THE LONDON COAL DUES.

The following members were added by the Committee of Selection to the Hybrid Committee of the House of Commons on the Coal Duties (London) Abolition Bill:—Sir Lyon Playfair, Sir Stafford Northcote, and Mr. A. Hargreaves Brown. The other members of the Committee (chosen by the House) are Mr. Baumann, Mr. Lawson, Sir Bernhard Samuelson, and Sir Richard Temple.

The following further progress was made with Bills during the past week:—

Bill read the first time: Newry Improvement Bill.

Bills read a second time Barry and Cadoxton Gas and Water Bill, Electric Lighting Provisional Orders Bill.

Bill reported: Cleveland Water Bill.

Bills read the third time: Burnley Corporation Bill, Cleveland Water Bill, Padiham and Hapton Local Board Bill.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, JUNE 21.

(*Before Mr. Justice* STIRLING.)

M'COLLA *v.* CLACTON GAS AND WATER COMPANY.

This was a motion, which, though only brought on for the purpose of deciding who should pay certain costs, involved an important question as to the right of individuals to sue a water company.

Mr. COSTELLO appeared for the plaintiff; Mr GATEY for defendants.

Mr. COSTELLO said he obtained leave from his Lordship just before the vacation to serve short notice of motion before the Vacation Judge. But when the time for hearing it arrived, the object sought—namely, the supply of water to the plaintiff's house—had been attained in another way, and it was adjourned to come before his Lordship; the defendants consenting to an interim injunction without prejudice to any question. The plaintiff had a house at Clacton which he occupied in the summer only; and in the spring of 1888, he made application to the defendants in the usual way for water, and it was turned on—the water-rate being 15s. a quarter. This was paid up to Michaelmas, prior to which, as the plaintiff alleged, it was agreed between him and the agent of the Company that, as he was leaving the house for the winter, the water should be turned off; and it was turned off accordingly. On June 3 last, as plaintiff was going to Clacton, an application was made to the Company on his behalf that the water should be turned on; and, as alleged, it was agreed by the Company's servant that it should be turned on for one month at a charge of 5s. The Manager, the next day, however, repudiated such an arrangement, and said the full quarter must be paid; and subsequently when a quarter's rate was tendered, refused to have the water connected unless 30s. was paid for the two quarters since Michaelmas, 1888. This was an attempt to set up a claim which it had been decided in the case of *The Sheffield Water Company v. Wilkinson* could not be maintained. The plaintiff thereupon endeavoured to find a magistrate; but it appeared there was no magistrate within five miles of Clacton, and that the magistrate's clerk lived 15 miles away. Accordingly the next morning the plaintiff came up to town and issued his writ, claiming a declaration that he was entitled to a supply of water, and an injunction to restrain the Company from continuing to keep the water supply cut off. In the meantime the defendants' Manager seemed to have become more reasonable, and wrote a letter enclosing a form of application, and offering to supply the water on payment of 15s.—one quarter's rate. This the plaintiff filled up, and sent in without prejudice; and thereupon the water was turned on, but in the meantime the notice of motion had been served. He submitted that under these circumstances, the plaintiff was entitled to come to the Court for protection, and that defendants ought to pay the costs.

Mr. GATEY said there were some details of the narrative given by the plaintiff with which he did not agree; but his main point was that the Court had no jurisdiction to entertain such an action—the remedy being provided in the Water-Works Clauses Act, 1847, wherein, by clause 43, a penalty was imposed on a company failing or neglecting to fulfil their duty with regard to the supply of water. It had been decided in *Atkinson v. The Newcastle and Gateshead Water-Works Company* that this remedy being provided, an individual had no right of action. He quoted several passages from the judgments of Lord Cairns and the present Master of the Rolls in that case in support of his contention.

Mr. COSTELLOE, in reply, maintained that the case referred to was of a different character; being an action for damages, which the plaintiff here did not seek to obtain, and that he was entitled to a declaration, and an injunction. Apart from the public duty imposed on the Company by the Act, as to any breach of which penalties might be imposed, he submitted that here on the evidence there was a contract between the plaintiff and the Company in respect of which he was entitled to sue. He also contended that it was too late for the defendants to raise this defence after submitting to an interim injunction.

Justice STIRLING said it appeared to him that this action was governed by the case which had been cited. Dealing with clause 43 of the Water-Works Clauses Act, Lord Cairns, in his judgment, said: "I should say without hesitation that it was no part of the scheme of this Act to create any duty which was to become the subject of an action at the suit of individuals—to create any right in individuals, with a power of enforcing that right by action; but that its scheme was, having laid down certain duties, to provide guarantees for the due fulfilment of them, and, where convenient to give the penalties, or some of them, to the persons injured. But where not convenient so to do, then simply to impose public penalties, not by way of compensation, but as a security to the pubic for the due performance of the duty." The learned Judge proceeded to say that it seemed to him the plaintiff was coming to enforce a right of action in respect to which he would be entitled to recover a penalty under clause 43 of the Water-Works Clauses Act, and on that ground the action could not be maintained. There were other matters in dispute, as to which he understood defendants had gone into evidence. Upon these he did not think it necessary to express an opinion, except to say that, in refusing the motion, as he was bound to do on the ground that the right sought to be enforced was not one enforcible by action, he did not think he ought to give the defendants any costs occasioned by going into these matters of detail, but simply such costs as would have been brought about by merely raising the question of jurisdiction.

SATURDAY, JUNE 22.

WOOD *v.* ODESSA WATER-WORKS COMPANY.

This was a motion to restrain the defendants from issuing certain debenture bonds and from otherwise acting on a resolution passed at a meeting of the Company held on April 24 last.* The Company was formed under an Act of 1882, with a capital of £850,000 divided into 42,500 shares of £20 each, of which 30,000 were "A" preferred shares; and 12,500 "B" deferred shares. All the "A" shares, and 12,420 "B" shares had been issued, and were fully paid up. For some years past, the Company have not paid a dividend; but the accounts now showed an excess of receipts over expenditure of £45,959, which was said to be available for payment of dividend. This sum did not exist in the shape of cash, but had been expended from revenue, instead of from capital, in extending the mains, &c. Under these circumstances, the Directors issued a report, in which after setting out a series of resolutions adopted by the Board, they stated that, having regard to negotiations now pending with the Municipality of Odessa as to new works and concessions, and to the decision of the Court of Appeal in *Lee v. Neuchatel Asphalte Company*, the Directors had resolved to raise, by way of further or second charge on the assets of the Company, the sum of £100,000 upon such terms as they might determine, and that £30,000 of such second charge should be set apart by way of dividend of £1 per share on the "A" shares, and be treated as on account of repayment of advances made out of revenue for capital purposes—the dividend taking the form of the issue of debentures. The resolution was passed on April 24. The plaintiff, who is the holder of 355 "A" shares and 50 "B" shares, was not present at the meeting; but upon being informed of what had been done, he expressed to the officers of the Company his objection to the resolution. On June 4 he received a circular offering debentures in accordance with the resolution; and thereupon he brought the action to restrain the Company from doing this, on the ground that it contravened the Articles of Association.

Justice STIRLING said the Articles of Association provided that the Directors might, with the sanction of the Company, declare a dividend; that no dividend should be paid to the "B" shares, unless the net profits for the current year should enable the Board to declare to the proprietors of the "A" shares a preferential dividend of 6 per cent. per annum; and, after the holders of the "B" shares should have been paid 6 per cent., the residue should be equally divided between both classes *pari passu*. The 104th article provided that no dividend should be payable except out of the profits of the Company, and that no unpaid dividend should bear interest against the Company. It was not disputed that profits had been earned. Therefore he had not to deal with the question which was decided in *Lee v. Neuchatel Asphalte Company*. But the point was whether it was within the power of the majority of the shareholders to insist, against the will of the minority, that the profits which had been actually earned should be divided, not by the payment of cash, but by the issue of debenture bonds bearing interest at 5 per cent., and repayable at par by annual drawings extending over 30 years. The rights of shareholders were governed by the Articles of Association, which constituted a contract, not merely between the shareholders and the Company, but between each individual shareholder and every other; and the question must be answered in the negative, if there be articles of contract between shareholders as to division of profits, and the provisions had not been followed. The debenture bonds, which it was proposed to issue, were not "payments in cash," but merely a promise to pay. He was of opinion that what was proposed to be done was not in accordance with the articles, and that the plaintiff was entitled to the injunction he asked.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

MONDAY, JUNE 24.

(*Before Justices* DENMAN *and* CHARLES.)

SALFORD CORPORATION *v.* THE GAS-METER COMPANY, LIMITED.

HUNTER'S COMMISSIONS AGAIN.

This was an appeal from an order of Mr. Justice Stephen, at chambers, staying the plaintiffs' action until they had delivered particulars of the fraud on which the statement of claim was founded.

Mr. GOULD appeared for the plaintiffs; Mr. ASQUITH for the defendants.

Mr. GOULD said in this case the learned Judge had set aside an order of Master Francis for discovery against the defendants, and adjourned the defendants' summons for particulars until after they had given this discovery. This had been reversed by Mr. Justice Stephen, who had adjourned the discovery until after particulars had been given. He contended that the order made by the Master was right under the circumstances, and fully warranted by authority. The plaintiffs' case, as set out in the statement of claim, was that they were the sole proprietors of the gas-works in Salford, and that they employed a Mr. Samuel Hunter as manager and confidential agent. It was his duty to examine estimates and tenders submitted by contractors, and to advise the plaintiffs as to the making of contracts and the purchase and repair of meters and other work. During the period between Jan. 1, 1876, and Dec. 31, 1886, while Hunter was still in their employ, the plaintiffs entered into contracts with the defendants for the supply of gas-meters and other apparatus, as well as for the repair of meters, on Hunter's advice; and it was alleged that these contracts and orders were corruptly obtained by the defendant Company, in that they secretly and in fraud of the plaintiffs agreed to pay, and did in fact pay, to Hunter commissions or bribes in order to procure his recommendation to the plaintiffs, and that the advice and representations made by Hunter were directly induced by such bribes. The prices charged by the defendant Company and paid by the plaintiffs under such contracts were, as the defendants well knew, in excess of the proper price by at least the amount of the bribe. The particulars of the contracts and orders upon which the defendant Company paid commissions or bribes to Hunter were delivered with the statement of claim. He would hand up a copy of these particulars to the Bench.

Justice DENMAN asked how the particulars handed in by the learned Counsel showed the bribes.

Mr. GOULD said they must be read with the statement of claim, which alleged that the amount of commission or bribe was at the rate of 10 per cent. on the price paid by the plaintiffs, or £1700 16s. The fifth paragraph of the statement of claim alleged that the amount of commission or bribe paid to Hunter was at the rate of 10 per cent. It said that the precise dates of payment and the amount were not then precisely known to the plaintiffs; but, by reason of these wrongful acts, the plaintiffs had sustained damage to the amount of £1700 16s. What the plaintiffs knew or suspected was this—that Hunter, who had been dealt with criminally for other frauds on the Corporation, had, by one process or another more or less occult, received 10 per cent. on the amount of these contracts. The plaintiffs could not be expected to know the precise way in which this fraud was accomplished. All they knew was that their servant had been bribed; and, as a natural consequence, the amount of the bribe had been added to the price paid for the work or the goods.

Justice DENMAN said, as the case was stated by the learned Counsel, it did not necessarily mean more than that the plaintiffs chose to suspect it. They alleged that it was in pursuance of some regular agreement for 10 per cent., but did not state any date of the agreement or any facts at all upon which the suspicion was founded—it was only suspicion.

Mr. GOULD said the plaintiffs could not give particulars of the agreement.

Justice DENMAN said this looked as if the action might be founded on mere suspicion.

Mr. GOULD submitted that if it was, the plaintiffs had a right to test the matter. They had given all the information they could.

Justice DENMAN said he thought one of the objects of particulars was to test the plaintiffs, and in this way to prevent them bringing an action on mere suspicion.

Mr. GOULD said there was the allegation that this fraud had been committed; and the information must necessarily, if the facts existed, be with the defendants, and with them alone, because the essence of the transaction was that it was a secret transaction, existing only between the bribing Company and the bribed agent. The learned Counsel then cited a case—viz., *White v. Ahrens* (26 Ch. Div.), a decision of the Court of Appeal affirming Vice-Chancellor Bacon—which, he said, was as nearly similar to this case as possible. There the plaintiffs employed the defendants to purchase goods as their agents at the lowest possible prices. The plaintiffs sued for an account; and in the statement of claim alleged that the defendants had purchased goods at prices higher than the current rates, and had corruptly received from the vendors allowances or commissions.

Justice CHARLES pointed out that in this case the defendant was the agent of the plaintiffs. The case would have been a parallel one if the plaintiffs were suing Hunter.

Mr. GOULD then cited another case—*Leitch v. Abbott* (31 Ch. Div.)—in which the plaintiffs employed the defendant, a stockbroker, and alleged he had in many transactions dealt with himself as principal, and had charged the plaintiffs with money not paid.

Justice CHARLES again pointed out that in this case also the defendant was the agent of the plaintiff, and not a third party.

Mr. GOULD submitted that, on the authority of these two cases, he was entitled to maintain the order Master Francis had made, and to set aside the order of Mr. Justice Stephen.

Mr. ASQUITH maintained that the order had been very properly made. The action was brought to recover damages for fraud; and a material allegation, with reference to which alone this order for particulars was made, was that the amounts in the fourth and fifth paragraphs (of which a list had been delivered simply setting out every contract between these two parties for a period of twelve years) were obtained corruptly, in that the defendant Company secretly and in fraud of the plaintiffs agreed to pay, and did pay, to Hunter commissions or bribes. There was here an allegation of an agreement to pay this commission or bribe; and in the fifth paragraph the plaintiffs went on to say that the amount of the commission or bribe was at the rate of 10 per cent.

Justice DENMAN suggested that if this had been going on for twelve years, it was a question whether the Statute of Limitations might not apply to a portion of the time.

Mr. ASQUITH said it appeared by the particulars rendered that the payments making the total of £17,000, on which the plaintiffs claimed the commission of 10 per cent., began on Oct. 22, 1875, and went down to 1887. Then it was alleged that the prices charged and paid were, as the defendant Company or their officers well knew, in excess of the proper charges; but this was a mere pleader's allegation. These people were, no doubt, shrewd men of business; and they had gone on for twelve years paying these prices, and had never suggested that they were not reasonable or proper.

Justice DENMAN suggested that corporations did not always contain shrewd men of business.

Mr. ASQUITH said this might be so; but it was a matter for observation that they had gone on for this long time, and it had never occurred to them that the prices were excessive until they had found this man out in other frauds, for which he had been sent to prison. His point was simply this—that there was an allegation of an agreement to pay a commission of a specified rate. When the plaintiffs made this allegation, they either knew of some facts on which it was founded, or they did not. If they did know of the facts, the defendants had the ordinary right of a defendant, against whom an agreement was alleged, to have the particulars

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* See JOURNAL, Vol. LIII., p. 820.

of the agreement specified. If they did not know of any foundation for the statement, then this action was admittedly brought on suspicion and conjecture, and in the hope that, by instituting an action, materials might be discovered which would lay a foundation for it, but which foundation ought to have been made before the action was brought. This being the state of the pleadings, the defendants applied to the Master for particulars of the alleged agreement; wanting to know where, when, and by whom they were made. An agreement of this kind could only be entered into on the defendants' behalf by some gentleman; and he wanted to know whether it was alleged to be a written or a verbal one, or what. On making this application, the plaintiffs replied, "No, we will not give these particulars;" and said that they were entitled, in the first place, to have discovery, and to ransack the defendants' books and accounts for the last ten or twelve years to see if they could not discover something which would enable them to frame particulars of the alleged agreement. He submitted that, on principles of common sense as much as of justice, a plaintiff who brought an action of this kind, which alleged specifically a fraudulent agreement against the defendants, ought not to be entitled to go on with the action, or to have inspection of the defendants' books and documents, until he had reduced to a definite form the allegations he had made. He believed the Master had only made the order in reference to the cases which were cited by his learned friend; but, as Mr. Justice Charles had already pointed out, there was a clear distinction between these cases and the present one.

Mr. GOULD having replied,

Their Lordships proceeded to deliver judgment.

Justice DENMAN said he thought this case was very much on the balance, and that a great deal was to be said in favour of either view. Although, if the case had come before him in chambers, he might have taken the same view as that taken by the Master, he did not think there were sufficient grounds for overruling the discretion of the learned Judge. The case of *Miller v. Herbert*—in which Lord Justice BOWEN said it was good practice and good sense that, when the defendant knew the facts and plaintiff did not, the defendant should give discovery before the plaintiff delivered particulars—would be highly applicable if the present action had been brought against Hunter. Where there was reasonable ground for thinking that the action was brought merely for the purpose of fishing out from the defendant something which, if true, would establish the charge of fraud, the Court would not assist the plaintiff by dispensing with that which was the *primâ facie* intention of the rules and orders—viz., that he should give full information of the fraudulent agreement upon which he relied. There was nothing to show that there really was such a fraudulent agreement as that suspected by the plaintiffs; and this being so, the learned Judge was warranted in ordering that the plaintiffs should give the particulars asked for before proceeding with their action. The case was by no means clear; but still it was one in which they ought not to overrule the discretion of the Judge without strong affirmative reasons for doing so. The appeal would therefore be dismissed.

Justice CHARLES said he was of the same opinion. He was far from saying that the case was a very clear one; but on the whole he thought the appeal ought to be dismissed. The action was brought upon an allegation of an agreement between the agent of the plaintiffs and the defendants, that the defendants would pay the agent commissions or bribes in order to procure the recommendation to the plaintiffs of the defendant Company's tenders or estimates; and the statement of claim alleged as a fact that the prices charged by the defendant Company, as that Company well knew, were in excess of the reasonable and proper charges by at least the amount of the bribes. This was an allegation of a fraudulent bargain. The statement of claim further alleged that the amount of the bribe was to be at the rate of 10 per cent. This being the nature of the charge, Order 19 Rule 6 directed that the plaintiff should, in his pleadings, state particulars of the frauds which he alleged. In compliance with this rule, printed particulars were delivered to the defendants of the contracts upon which it was alleged the bribes had been paid. It was obvious that these were no particulars at all of the agreement under which the defendants had agreed to pay the bribes. Accordingly, a summons for better particulars was taken out by the defendants. But the Master thought that these particulars should not be ordered until discovery had been made by the defendants; and the whole point of the controversy was whether or not discovery should precede delivery of the particulars. His Lordship then dealt with the authorities which had been cited, and said that none of them were similar to the present case, which was one where a third party was attacked on a suspicion of collusion between the agent of the plaintiffs and himself. It was no more than suspicion. The plaintiffs had found out that their agent was a rogue; then they looked more closely than they had previously done into the prices they had paid; and upon this they had launched a definite and specific charge of a corrupt agreement. He thought, before the plaintiffs could call upon the defendants for discovery of their books, they must give some particulars of the specific charge they made of a fraudulent agreement between the defendants and their own agent that the defendants should give him a bribe.

The appeal was therefore dismissed, with costs.

FAILURE OF THE GAS SUPPLY AT ERITH.—On Monday night last week, the gas supply to Erith and Belvedere from the Erith works of the West Kent Gas Company is reported to have been suspended from 8.45 till about 9.30, to the great inconvenience of the consumers.

THE LONDON COUNTY COUNCIL AND ELECTRIC LIGHTING.—At the meeting of the London County Council last Tuesday, Mr. Alderman Haggis (Chairman of the Highways Committee) reported, with reference to the letter received from the Board of Trade, enclosing a copy of the Model Electric Lighting Order, as mentioned in the JOURNAL last week, that the Order had been considered by the Committee, the Council's officers, and their Parliamentary Agent, and, deeming that a number of amendments were desirable, they had requested the Chairman of the Committee and Mr. Benn to confer with the Board of Trade on the subject.

THE MURDER AND ATTEMPTED SUICIDE BY A WATER-WORKS MANAGER.—Last Tuesday an inquest was held on the unfortunate man Letine, whose death at the hands of Nathaniel Curragh, the Manager of the Crayford works of the Kent Water Company, was recorded in the JOURNAL last week; and a verdict of wilful murder was returned. The circumstances under which the attack upon Letine was made will be in our readers' recollection. It seems now that the idea which had taken possession of Curragh, that his daughter's death was the result of Letine's cruelty while she was a member of his troupe, was a pure delusion, which gradually developed into monomania. He was visited in St. Thomas's Hospital last Wednesday by Dr. Forbes Winslow, who, after a long interview, pronounced him to be undeniably insane. The wound in the roof of his mouth, caused by the pistol shot, has made favourable progress since the extraction of the bullet soon after his admission to the hospital.

Miscellaneous News.

THE COMBINATION AMONG GAS WORKMEN.

CONFERENCE OF DIRECTORS AND REPRESENTATIVES OF THE STOKERS OF THE SOUTH METROPOLITAN GAS COMPANY.

The Directors of the South Metropolitan Gas Company have issued to the men employed in the retort-houses at the various works a pamphlet containing a report of the proceedings at an interview which certain of the stokers deputed for the purpose by their fellow-workmen had with the Chairman, Mr. George Livesey, the Deputy-Chairman, Mr. J. Mews, and Mr. Robert Morton, one of the Directors, at the Old Kent Road works, last Wednesday week, on the subject of the eight-hour movement, to which several references have been of late made in these columns. Space will not permit of a full account being given of all that transpired at the conference; but we give a *résumé* of what took place, and this will show the arguments adduced by the men in support of their claim for a reduction of the hours of labour.

In his introductory remarks, the Chairman first expressed the pleasure of the Directors in meeting the men. He then proceeded to say that it was within a few days of 50 years since his father came to the works; and he (the Chairman) did not remember any occasion on which the men had had any cause to complain. But if they had had any, they had been free to go to headquarters, and to state their case. Those who had charge of the works had been ready to hear the men on all occasions. Moreover he felt in meeting the men that day, the Directors met them with clear consciences. They were not conscious of ever having done any unfair, unjust, or harsh act towards the men. There might have been cases of hardship and cases of injustice, which there always would be where a large number of men were engaged. But it had not been by the will of the Directors; and when it had come to their knowledge, they had been ready to redress it. Hitherto, he believed, the Directors had not met the men; but increases of wages had been made, and other privileges granted, without any solicitation on their part. The cessation of Sunday work was not at the request of the men; but partly by the action of the Secretary of the Lord's Day Observation Society and the Engineers. Mr. Morton took a prominent part in that movement, with the object of helping the men, and relieving them of the worst part of their labour. He was not aware that the men had any complaints to make; but at any rate they all knew, or ought to know, that the Directors were always ready to listen to them. He asked if what he had stated was not true. They had really tried to be good masters. It seemed now that the great point was this question of eight hours; and the Board had called the men together to hear what they had to say. It would, he said, hardly come with good grace from him to object to eight hours work, if it could be found practicable, seeing that two years ago he seriously discussed the matter with the foreman, and last summer the latter actually consulted with some of the men, and asked whether they thought it would be an advantage to them to do their work in eight hours, instead of twelve. There were many difficulties about this, and that was one of the reasons the Directors wanted to meet the men. He urged them to state plainly and clearly what they felt in regard to the matter; and if there was any hardship, or any injustice, or any grievance, not to be afraid to mention what it was. In pointing out that the Directors desired to deal with their own men, he quoted from a speech delivered by Mr. Burns at a recent meeting of gas stokers, in which that gentleman counselled his hearers to be led by men with whom they had worked, and not by outsiders. This, the Chairman remarked, was very good advice. They were under the impression that part of this trouble—if trouble it could be called—had been caused by some difficulties at Beckton. Now it must be remembered that the work varied at all places. Even with their own stations in some instances they had stage houses, and in other cases ground-floor houses. Some places had large coke-ground; and some had very little. At Beckton the work, he believed, was different; and the men were obliged to live a long way from the works—some of them two or three miles. In their own case nearly all the men resided in the immediate neighbourhood of the works; and therefore there was a great difference between them and Beckton. He was rather amused at one thing said by Mr. Burns. A good many things were said at these meetings which showed that the speakers did not know everything; and Mr. Burns evidently did not know about gas stoking. He said that he knew something of gas-works, having worked in them as an engineer. "He remembered once," the report continued, "laying a wager—he believed it was for a glass of ale and a bottle of lemonade (laughter)—to fill so many retorts with coals at Croydon; and by the time he had finished, he was nearly strangled—he had lost his necktie, a portion of his waistcoat, and nearly all his shirt." He (Mr. Livesey) thought the laughter of the stokers must have been at the idea of a man drawing and charging retorts wearing his necktie and waistcoat. It was statements like these that went down with the public; but those who knew something about the work were well aware that it was only something to be laughed at. The Chairman reiterated that the Directors had done a good deal voluntarily, without any pressure; and the men knew that if it was not for the prosperity of the Company, they could not give them a week's holiday and double pay, nor could they have abolished Sunday labour. But this was an act of justice; and, at whatever loss, it ought to be sustained by the Company. The very fact of the prosperity of the Company had enabled them to do these things. The Chairman here corrected a very prevalent error in regard to the "high" dividends paid by gas companies. For thirteen years —from 1876—Parliament had required them, he said, to sell all their new capital by auction; so that a person who bought £100 of stock, on which he received 13 per cent., had to pay more than £200 for it. Therefore, instead of obtaining 13 per cent., he only received about 6½ per cent. The Company had really dealt hard with the capitalist, because all the extensions at East Greenwich, and all the money that they had required for enlarging the business since 1882, had been raised at the lowest possible rate of interest. Nearly half a million of money had been raised at 3¾ per cent. interest. Referring to the common practice, when times are bad, of paying less wages, he said they had never reduced the wages of their men, as was done in coal mines and on railways. The Midland men were now asking for the restoration of 1s. a week that was taken off their money some time ago. The Directors of the South Metropolitan Company believed in fair work and just pay; and the wages of the men were good. The men, the Chairman continued, did not ask for an increase of wages; but they desired something equivalent. In their petitions they asked for a decrease of work at the same pay, which was equal to asking for an increase of pay —a considerable increase—something like 25 per cent., or more, in some cases. This, he was sure, they would feel was unreasonable. The Directors were anxious, and always had been (he could say that with a clear conscience), to deal fairly and liberally with their men, and to meet every reasonable request they might make. In conclusion, he again said that the Directors would not listen to anything coming from outsiders; but would adopt Mr. Burns's advice. They would deal with their men;

and he asked them to consider their own interests, and do what they thought was right, disregarding what outsiders might say.

The Old Kent Road men were the first to state their case. In brief, they averred (as did all the men who followed from the other stations) that they had to use heavier tools and scoops than formerly, and that they had to put a larger quantity of coal in each mouthpiece. In the retort-houses where machinery had been installed, there was also an increase of work. The Chief Engineer (Mr. F. Livesey) stated that the scoops weighed 72 lbs. in 1879, and were now 10 lbs. lighter; the scoops were now made of steel instead of iron; and there were clinker plates in all the furnaces. The Chairman admitted that there was a little extra coal to put in the retorts. In 1879, 5 cwt. 12 lbs. was the average charge; and in 1889, 5 cwt. 1 qr. 4 lbs. This was an increase of 20 lbs. per charge. One of the men reminded him that 20 lbs. per charge over a twelvemonth added considerably to the work. The men at this station occupied much time in placing unimportant matters before the Directors, which (as the Chairman pointed out) could and will be attended to by the foreman. Getting back to the discussion proper, and to the point of the twelve hours' labour, it was asserted that the stokers worked 1¼ hours at a time before the retorts, which, with high heats, was very laborious. The Chairman denied the first part of this statement; but granted that 40 minutes was the time in which a draw could be done, and this the men had once in two hours. Besides, he did not think they were on the works quite twelve hours. "The noble manner in which the Directors had met the men, and the gentlemanly spirit in which the Chairman had addressed them," was acknowledged by one speaker, who remembered the time when the Chairman spoke about the eight-hour day previously. The reason, this man affirmed, why the men consulted did not then see their way to adopt the eight-hour system was because they could not do the work in the time, and that was what they said now. If some of the work was taken off, then they could do it in the shortened day. The consumers of gas considered that the men deserved to have their hours reduced to eight. The price of gas was being lowered, but the men did not get any benefit. The competition of mineral oil and electricity, the Chairman mentioned, compelled them to reduce the price. On that much debated point as to the age to which men can continue at stoking work, it was thought by one of the delegates that they could not stand it "long after they were 40 years of age;" while the Chairman had "*known* men to stoke up to nearly 60," and he added that, when the men were unfit for this work, the Company generally found outdoor work for them. Replying to a complaint that, whereas the men used to burn seven sacks of coke in the fires, they now had to put in ten, the Chairman said (and he declared the same thing several times in the course of the proceedings) that where "it can be proved that the work has increased in the last ten years, there will be no hesitation on the part of the Directors to give a corresponding increase of pay. I have particulars here of some works where there has been no increase at all." He afterwards inquired whether the men could not work a little sharper, so as to get the four hours off, though, of course, he understood that it would be impossible to do the same amount of work in the eight hours that was done in the twelve. A negative reply was given. As to the number of retorts to constitute a day's work, the Old Kent Road men had fixed 80 with a four-handed gang; representing, said the Chairman, a reduction of work of 28½ per cent., which was equal to an increase in wages to be paid by the Company of 40 per cent., or about one-third! The men now stop work for twelve hours on Sunday; and with the eight-hour system the fires would have to be kept going by the yard-men for 16 hours. To obviate this difficulty, it was suggested by one man that those who went to work at six on the Sunday evening would have to continue until six next morning. Referring to the 2000 or 3000 tons of coal which could not be accounted for a few years back, a speaker said that it did not go into the retorts, or the gas from it into the holders; but it went underneath the mouthpieces, where it was forced to go. This represented additional work put on to the men that the engineers knew nothing whatever about. Mr. Morton suggested that a large proportion of this coal might have been spilt by the carelessness of the men; but this they would not admit. On the 150,000 tons of coal used by the Company, this loss, Mr. Livesey pointed out, was only 2 per cent. Discussing the matter of wages, the Chairman stated that the Old Kent Road stokers received more than those at Rotherhithe or Vauxhall; and one of the men remarked that his wages were 5s. 6d. a day, while his two men had 5s. 2d. In this connection, Mr. Morton observed that this was a question, as between master and man, of wages for a certain amount of work. The wages at the present amount were for a given number of retorts; and making a concession to 84 or 80 retorts made the increase of wages 25 per cent. He did not think the men knew of any instance of an increase of wages in any trade all at once of 25 per cent.

The Vauxhall men next addressed the Directors; and what they had to say was very similar to what their comrades at Old Kent Road had already put forward. Formerly they charged most of the retorts with from two scoops to two scoops two shovelfuls; and the middles, it appears, with three scoops. Now, however, they did three-scoop work all round; and "not a penny pay more." The Chairman allowed that this was an increase; and at this juncture, he asked whether the men had ever thought of doing the stoking on piecework, and be paid at so much per ton. Personally he could not see any objection; and as to the weight of coal, there could be no dispute. To this one of the stokers jocularly remarked that they might lose under that system 3000 tons of coal. Proceeding it was stated that the men considered 72 retorts of three-scoop work should constitute a day's labour. In support of their claim for an eight-hour day, one of the men pointed out that it would give them a better opportunity of studying their interests than they had at present; and if they had a few more hours at their homes, they could make them brighter for their wives and children. The charges of each through retort works out to 5⅞ cwt. at Vauxhall; and the Chairman again stated that the Directors were prepared to make an increase in the wages in proportion to what they were to the work ten years ago. He believed they would be willing to give something more than this, but not to the extent of 25 per cent. If the men asked to have the work reduced 25 per cent., they must, he thought, see the necessity of having somewhat reduced wages. One of the stokers from this station incidentally mentioned that he had worked at Darlington, where eight-hour shifts were in vogue; and it answered there very well. Another man desired that the stokers should be permitted to go out to their meals the same as the yard-men and fitters; but the Chairman pointed out the impossibility of this if they had the eight-hour day, as they would have to work every hour. Some of the men were under the impression that the reduction in their hours would provide work for more men; but the Chairman quickly dissipated that idea by stating that it would ultimately put less men into work, because, if the Directors found the men were unreasonable, and they had to give way to anything unreasonable, they should start machinery everywhere. It would end in less men being employed.

The East Greenwich men also held that it was too long to work for twelve hours in the retort-house. They had to do 90 retorts in that time; and if they could make it workable, they ought to get the eight hours. They asked for a reduction to 75 retorts, which, observed the Chairman is equal to 16⅔ per cent. The stokers, it was urged, would really do more work in the eight hours than they did now. At the present time, in the twelve hours, they were doing 90 retorts, which meant seven per hour and six over. If they had eight hours, it would be nine and three over. In favour of the eight-hour day, it was said that if the men had a little recreation in the evening, they would be recruiting their health, and fitting themselves for their work the following morning. In a gas-works, they could not go out and enjoy themselves. Their wives and families did not care always to remain indoors; but they could not go out with them because, when they had finished work, they were too tired. It was acknowledged that some of the men would abuse the concession of time; but the Directors ought not to take into consideration the few black sheep. From the statements made, it appears that the men at East Greenwich are much worse off in regard to house accommodation near the works. The houses on the Marsh, it was alleged, were very bad and damp; and it was a bad place to get to.

The delegates from West Greenwich followed; and the first one stated that at this station, on stage work, they required men "made on purpose" to lift the scoops. "That is all pointing to machinery," remarked the Chairman. For health's sake, the men required the hours reduced to eight. They were now doing 84 long retorts with a three-handed gang; 98 in some instances. They asked for a reduction of twelve retorts in one case, and 26 in the other; representing, said the Chairman, about 14 per cent. and 36 per cent. increase of wages to the Company. "We could not manage to do any more," observed one man. "Then," replied the Chairman, "you must make us some amends by receiving less pay. We cannot give the same pay for eight hours' work as we do for twelve, if the work is to be reduced so very largely." Another speaker said that the amount of coal they put into the retorts was quite 1½ cwt. in each scoop; and "this made him bend." The scoops were 11 ft. 4 in. in length. The Chairman promised that the long retorts should be altered.

The deputation from the Rotherhithe works stated that two scoops were the allotted task for 108 retorts. At present they done three scoops for 100 retorts; and this showed that the work had grown considerably with them. The Engineer of this station (Mr. Browne) remarked that the normal work was 100 mouthpieces—50 retorts. It was 108 originally; but in 1885, with the Chief Engineer's sanction, it was reduced to 100. At the same time the original scoop was put in some of the retorts only twice. But that scoop was considerably reduced; and the new scoop had to go in three times in the majority of the retorts, and two-and-a-half times in the case of the others. The scoop was very much lighter, though the charge for the retorts was three as against two; and he admitted that, whereas ten years ago an average charge was 5 cwt., it now worked out over several half years at an average of between 5 cwt. 1 qr. and 5 cwt. 2 qrs. One of the men said he was positive that 6 cwt. went into each retort; but Mr. Browne pointed out that at the end of the year there was a surplus of 700 tons, so that the charges had been a little less than they thought. The men requested the deputation to say that they required more time at home and for recreation, which (naturally) they considered would be a "good thing."

The men from Bankside were next heard. At the present time, they were working 126 retorts, with four men and a fire raker. They had to put three scoops in the tops, and in the centre middles, and two scoops in the side middles and bottoms. They had come to the conclusion that 72 retorts for three men, or 90 for four men, with three scoops, was sufficient work; and that was merely a reduction of twelve retorts of three-scoop work. In times past the scoops held about 1 cwt.; but now they carried close upon 1¼ cwt. The scoops in 1879 were 9 ft. by 7 in. by 6 in.; and now they were 10 ft. by 8 in. by 10 in. The Chairman pointed out that the Bankside men were asking for 23·8 per cent., or 24 per cent., reduction of work for the same pay. This was unreasonable. Coal miners sometimes asked for an increase of 20 per cent.; but were glad to take 10 per cent. But, as a rule, they only desired 10 per cent., and obtained 7½ or 5 per cent. He had never heard of anyone wanting a 25 per cent. increase. In some cases where the eight-hour day had been adopted, the men had taken the same amount of work as they had done in the twelve hours; and instead of an interval of an hour, they took an interval of half an hour.

One of the Old Kent Road men at this stage raised the question as to the pay when they were called upon to do Sunday work. He said that they desired double time paid. The Chairman said the Board were quite determined on that point. They paid time-and-a-half for Sunday work at some of the stations; and they would extend it to all. There would be no extra pay for overtime—in fact, there would be no overtime. They wanted to avoid Sunday work as much as the men did. Time-and-a-half was paid from six to six on Sunday; and they would pay nothing extra after six in the evening.

Mr. Morton, in "summing up," said the Chairman had replied definitely to one or two of the questions; but there were two or three others that they could not take upon themselves to answer definitely yet. What had been said would be submitted to the Board; and any adjustments such as had been pointed out with regard to giving increased pay for an increase of work at one or two of the stations, and an adjustment of the wages all round, would be made. He thought they would be prepared to recommend to the Board that the eight-hour system be adopted as the men requested; and further, after the adjustments that he had spoken of had been made, an increase in the rate of wages, or, on the other hand, a decrease in the amount of work (which meant the same thing), might be granted. What this would amount to, would be carefully considered. They had already told the men that it would not be anything like what they were asking for; and he thought that, when they had considered the matter again, they would see that the increase of pay requested, or the decrease of the amount of work, was more than could reasonably be expected. The Directors would carefully consider the whole matter; and perhaps they would be prepared, after the adjustments had been made, to agree to some of these things.

The Chairman very decidedly stated that the increase of pay would not be anything like what the men were asking for. To reduce the work 25 per cent., with the same wages, meant 33 per cent. increase of wages, because four men would be required to do the work of three. As far as irregularities were concerned, the Directors would try to adjust all these as nearly as possible, and put all on a fair footing. As he said at the outset, having suggested the eight-hour system two years back, and again last year, he could not object to it now; but he could not see his way to recommend the Board to give the same pay for a reduced amount of work that they were now giving for the twelve hours' labour. If they would talk the matter over with their mates, and would fairly consider it, they would see the unreasonableness of asking anything like a 25 per cent. increase; and they would be able to come to some satisfactory arrangement. But if there was a determination to stand out for the 75 retorts at the same pay, then the Directors would have nothing to do but to say that they could not give it; and they would be at loggerheads at once. It would, he said, be extremely regrettable to the Board to have any difference with the men; but, if fighting was forced upon them, they must fight. Fifty years ago his father came to the works; and if there had ever been any dissatisfaction with the men, it had always been settled in an amicable

way. He hoped common sense would prevail, so that they might come to a satisfactory agreement; and the old relationships be continued. They wanted to be friends with their men; and they wished to see them doing well for themselves. It was a great satisfaction to the Directors to see the number of old stokers now working for the Company; and when they were past working altogether, he was glad to meet them, and to shake hands with them, and to find they were comfortable in their old age. But there was the other side to it. If the old system was done away with; and it became a question of so much work for so much wages, all these privileges and advantages would be knocked on the head; and they would enter on a plan that certainly would not be conducive to the happiness of either side. He was pleased with the straightforward manner in which the men had put the whole matter before the Directors. It was evident to them that, on the one question of the 72 mouthpieces, they were all acting in concert; and he asked them on that point to consider that they could not concede it. Reasonableness must, he said, take the place of the present feeling; and then he had no doubt they would work satisfactorily together. There was one other point it would be worth considering; and that was as to the work being done at so much per ton of coal. The idea in his mind was that there should be so much wages paid per ton of coal, provided (say) 10,000 cubic feet of gas were produced from each ton. There would be a certain increase of pay for each 100 cubic feet above the 10,000 feet; and a reduction for each 100 feet below that figure. It would obviate, he believed, all the difficulties and discussions as to additional work being thrown upon the men. They would get more pay if they did more work. He thought piece-work ought to be practicable in regard to retort-house work, though he did not know where it was done. In conclusion, he said he desired it to be thoroughly understood that if at any time anything happened that the men thought was not fair to them, or that anything could be done to improve their position or add to their comfort, the Directors would always be ready to consider what they had to say, and do what they could to help them.

The men tendered their thanks to the Directors for the kind way in which they had received them; and the interview was brought to a close.

THE ULTIMATUM OF THE DIRECTORS.

As the result of the deliberations of the Directors consequent upon the interview above reported, the following notification of their determination was, we understand, posted up yesterday in the various works of the Company:—

To the Retort-House Men.

The Directors have carefully considered the question of a change from twelve to eight hour shifts, which was suggested last year and the year before by the Chairman, and is now asked for by the men.

A reduction is asked for in the amount of work, ranging from nearly 17 per cent. at East Greenwich, to over 28 per cent. at the Old Kent Road; but the average for all the stations may be taken at about 25 per cent., which means an increase in the wages of 33 per cent., because four men would be required to do the work of three. Such an increase, on the good wages now paid, is so excessive that no reasonable man can expect it to be entertained.

The men must remember that in bad times the wages have never been reduced; that 5s. 4d. and upwards a day now paid to stokers is a high rate for unskilled labour; that, in addition, they have valuable privileges, consisting of the week's holiday, with full pay after one year, and double pay after three years' service; of work being found in the yard when no longer able to work in the retort-house; and a pension in old age, besides some other advantages of less importance.

(*a*) The Directors have also considered the various statements made by the representatives of the men on the 19th inst.; and finding exact uniformity in the work at the different stations extremely difficult of attainment, but recognizing the increase in the weight of the charges at some stations, and the desirability of making the work as nearly uniform as possible, they are prepared to increase the pay at all stations for twelve-hour shifts from a maximum of 5s. 4d. to 6s. a day for ordinary stokers, from 5s. 6d. to 6s. 2d. a day for scoop-drivers, and firemen and others in proportion; and to give to all stokers and firemen at all the stations 1s. 6d., and to barrowmen and cokehole men 1s. per week as good-time money. But the conditional 2s. 6d., which is only given at the Old Kent Road, will be discontinued, whatever system may be adopted.

The work done by the stokers at the various stations appears to be about the same in amount, though it is differently arranged. At one station, each man has 14 retorts, or 28 mouthpieces, and two fires; while at other stations (where the fires are attended by firemen), the number of retorts per man is greater—viz., 16 retorts, or 32 mouthpieces, to each man—96 mouthpieces to a gang of three men being about the average amount of work now done.

Should the eight-hour system be adopted, to which the Directors are quite ready to agree, the work will be made as uniform as possible. Firemen will be appointed; and the work of the stokers will be as much as possible confined to the retorts. The wages will be 5s. 4d. for stokers, and 5s. 6d. a day for scoop-drivers, and 1s. 6d. a week good-time money to all stokers and firemen; and the work will be reduced from 96 to 80 mouthpieces for a three-handed gang. This is a reduction of 16⅔ per cent. in the work; and as the wages will remain practically unaltered, it is equal to an increase of 20 per cent. in the wages paid by the Company.

If the men prefer it, the work of the eight-hours' shifts may be reduced below 80 mouthpieces; but in that case the wages will be reduced in proportion. If 75 mouthpieces should be adopted as the day's work, the wages will be reduced to 5s. for ordinary stokers, 5s. 2d. for scoop-drivers, and those of firemen in the same proportion; and the good-time money for stokers and firemen will be reduced to 1s. 4d. per week.

For Sunday labour, between 6 a.m. and 6 p.m., on the rare occasions when it may be necessary to work, time-and-a-half will be allowed at all stations.

The work of labourers, cokehole men, and barrowmen engaged in the retort-houses varies so much at the different works, that it is impossible to set forth in this notice the exact conditions of their work and wages. But the Engineers have received instructions to deal fairly in all cases, and to see that they do not suffer from any change in the working. Good-time money of 1s. per week will be allowed to these men at all stations.

The Directors request the men at each station to make their own choice, which may be different at different stations, and to notify to their Engineer, on or before Friday next, which of the above proposals they wish to adopt. Failing such decision on their part, the work will be continued on the present system of twelve-hours' shifts, with the increased pay as set forth in the paragraph marked (*a*); and in any case the regular men will be required to enter into a mutual agreement with the Company to give or receive a month's notice before leaving their employment or altering the system of working.

By order of the Board,
FRANK LIVESEY,
Chief Engineer.

GAS UNDERTAKINGS AND THE REVISED RAILWAY RATES FOR COAL.

We have received from Mr. J. Deakes, of Worcester, a copy of the following circular on the above subject, which he is sending to the managers of gas undertakings and others interested in the matter with which it deals:—

Railway and Canal Traffic Act, 1888.

Sir,—You are doubtless aware that under the provisions of the above Act a "Revised Classification of Merchandise Traffic and Revised Schedule of Maximum Rates and Charges applicable thereto," is required from the Railway Companies to be submitted to the Board of Trade.

Clause 27—one of much importance—is intended to redress inequalities in rates of carriage where allegation is made of "undue preferences" being given. Under this clause the railway companies announce that the rebate hitherto allowed upon gas coal traffic to all gas-works in the kingdom must cease. In the words of one of the leading Railway Companies, it is stated "that in the opinion of the railway Companies, it is, to say the least, exceedingly doubtful whether rebates on gas coal would not be held to be an undue preference. The large preponderance of opinion is that it is so far doubtful that the railway companies should not subject themselves to the serious risk which any contravention in this respect of the provisions of the Railway and Canal Traffic Act would entail upon them." And in a subsequent letter from the Manager of the same Company, dated June 26, 1889, the following passage occurs:—"In further reference to your letter of the 27th ult., I beg to say that the question of rebates on gas coals has since had the almost continuous consideration of the several railway companies, and that, after a long discussion on Monday last, it was decided not to allow such rebates unless the authoritative decision of the Railway Commissioners shall be first obtained protecting the companies against claims for damages"—that is for alleged "undue preference."

My Company contend that the provisions of the above Act do not apply to gas undertakings, inasmuch as they are not *traders* in coal. Moreover, gas undertakings are fettered by Special Acts of Parliament restricting prices charged for gas, &c.

If the railway companies are allowed to abolish the rebate, it means an increased cost to the gas industry of the kingdom of *several hundreds of thousands of pounds per annum;* and it is proposed that gas undertakings shall be made the medium of levying this amount from the public for the benefit of railway companies. The matter is aggravated by the fact that this unjust burden is attempted at a time when the demand of colliers and colliery interests is seriously adding to the cost of coal.

The basis of tenders for coal is that if railway companies hereafter allow the rebate, a corresponding reduction will be made by colliery-owners to gas undertakings. It is hardly conceivable that the railway companies will surrender this easily-won prize, where not a protest or effort of resistance has been shown!

My Company are quite willing to undertake the responsibility of "protecting the railway companies against owners or managers," so far as the coal supply to Worcester is concerned; and it is suggested that if gas undertakings throughout the Kingdom would unite and make a similar proposition, the difficulty now set up by the railway companies against the continuance of the rebate must disappear.

My Company are prepared to contribute to a fund for an opinion of one or several eminent Counsel to be taken, to be submitted to the Board of Trade and to the Railway Commissioners, with a view to claiming exemption from the operations of this clause, which they conceive is unwarrantably strained.

I shall be much obliged if you will inform me if your Committee are prepared, and to what extent, to concur in immediate action being taken to test this matter.

June 28, 1889. (Signed) J. DEAKES.

THE ELECTRIC LIGHTING SCHEME FOR LEEDS.

THE COMMITTEE'S REPORT.

The Electric Lighting Committee of the Leeds Corporation have drawn up a report on their proceedings, and given the particulars of the proposed scheme for lighting the town by electricity from a central station. The report begins by reminding the Council that, at their meeting in May, 1883, the sum of £10,000 was granted to the Committee "to carry out an experimental system of electric lighting within and about such portions of the Municipal Buildings as the Committee may consider desirable," and then it explains at some length how the money has been expended, and with what success. The total expense incurred up to the present has been £10,233, or practically the amount originally voted. The report goes on to say that, whilst the Council's instructions to the Committee were limited to making experiments in and about the Town Hall, in compliance with a generally expressed wish, they deemed it their duty to go into the question of lighting with electricity the centre of the town. To secure the best possible method the Committee visited various towns where the electric light is used, and then made inquiries to ascertain the disposition of the tradespeople in regard to an electric light supply. The desire to have the electric light was almost unanimous. After ascertaining the exact number of lamps which would be required in a given area, and using this as a basis, it was found that the number of public and private lamps required for lighting the district would be about 37,500. The piece of land known as "the Midden" has been fixed upon for the central station, and tenders show that the machinery and other plant required will cost in all about £58,000. To supply private residences, however, would cost an additional £10,000; making in all £68,000. The Committee point out, however, that, whilst the latter amount would be required to carry out the whole of the scheme described, the electric lighting station would consist of a unit or initial plant, which might be multiplied from time to time as the demand for the light increases. For this reason, they would not advise this central lighting installation for Leeds to be, in the first place, larger than would involve an expenditure of £25,000. As to the question of cost, the Committee are of opinion that an incandescent 10-candle power lamp can, after paying for depreciation and interest, but not making a profit, be run for about one-eighth of a penny per hour. Comparing this with the present price of gas in Leeds, electric lighting can be supplied at 20 per cent. above that price; but as the customers would have in addition to pay for renewing their lamps, this would probably add 40 per cent. to the total cost. According to the present price, or taking gas and meters at 2s. per 1000 feet, the electric light would in price be equal to gas at 3s. 5d. per 1000 feet.

A NEW WATER SCHEME FOR PONTEFRACT.—A special meeting of the Pontefract Town Council was held yesterday week, to consider the tenders for carrying out the whole of the work of testing, the sinking of wells, and procuring water from Roall, near Whitley Bridge. The Water Committee recommended the tender of Messrs. Vickers and Sons, of Nottingham, for £22,800, for carrying out the whole scheme; but on condition that should the sinking of the wells at Roall not prove satisfactory, and an abundant supply of water be found, the remainder of the works shall not be proceeded with.

EDINBURGH AND LEITH CORPORATIONS' GAS SUPPLY.

The First Annual Balance-Sheet.

The first balance-sheet of the Gas Commissioners of the Edinburgh and Leith Corporations, as prepared by the Treasurer (Mr. Gibb), was published last week. It will be remembered that the gas undertakings in Edinburgh and Leith came into the hands of the Commissioners on Aug. 1, 1888; the stocks on hand, debts, and general affairs of the two Companies whose works were purchased being taken over as from Whitsunday, 1888. In the capital account, £242,466 9s. 8d. is put down as the value of the manufacturing and storeage plant; mains figure for £146,621 8s. 8d.; services for £4724 7s. 3d.; meters for £38,718 1s. 5d.; and law and parliamentary expenses for £22,671 7s. 3d.—the total being £462,303 12s. 3d. To balance this there is 10 per cent. annuity stock, to the amount of £200,000, issued to the shareholders of the Edinburgh Gas Company; 9½ per cent. annuity stock, to the amount of £150,000, issued to the shareholders of the Edinburgh and Leith Gas Company; and loans on mortgage, £103,698 10s. 4d.—leaving a balance of £8605 1s. 11d. The following are the revenue and profit and loss accounts:—

Revenue Account.

Dr.			
Manufacture of gas—			
Coals	£66,686	4	11
Purifying material, &c.	4,378	0	4
Salaries of engineers and wages paid at works	25,863	0	4
Repairs and maintenance of works and plant	6,277	10	0
	£103,051	15	7
Distribution of gas—			
Salaries and wages of rental clerks, &c.	4,628	2	8
Repairs and maintenance of pipes	1,527	6	11
Repairs and maintenance of meters	3,362	11	7
Miscellaneous charges	5	0	0
Management—			
Salaries of Treasurer, Clerk to Commissioners, Auditor, and Treasurer's clerks	1,180	12	8
Salaries of collector and assistants, &c.	1,949	5	8
General establishment charges—insurance, printing, and stationery, office expenses, &c.	1,862	0	7
Rents, rates, and taxes	3,768	2	4
Law and Parliamentary expenses	87	3	0
Pensions to servants of the Edinburgh and Edinburgh and Leith Gas Companies	1,533	11	2
Discounts, abatements, and bad debts	2,062	8	0
	£124,897	0	2
Balance carried to profit and loss account	70,427	2	4
	£195,324	2	6
Cr.			
Sale of gas	£169,993	6	1
Meter-rents	6,526	10	7
Residual products, coke, and waste lime	18,381	5	2
Rents of heritable properties not in Commissioners' own occupation	403	3	2
Transfer fees	19	17	6
	£195,324	2	6

Profit and Loss (Net Revenue) Account.

Dr.					
Annuities from Aug. 1, 1888, to Whitsunday, 1889				£26,500	16 1
Interest on mortgages, &c.				8,231	12 10
Expenses connected with transfer and delivery of the concerns				1,081	8 9
Expenses of mortgages				557	1 3
				£31,370	19 6
Balance				39,066	2 10
Proposed to be applied as follows:—					
To sinking fund for repayment of money borrowed, being 1 per cent. on £103,698 10s. 4d., in terms of section 93 of the Act	£1036	19	8		
To sinking fund for redemption of annuities, being 15s. per cent. on £969,000, the capital value thereof, at 28½ years' purchase, in terms of section 94 of the Act	7267	10	0		
To reserve fund, in terms of section 86 of the Act	27,000	0	0		
To balance to next year	3761	13	2		
	£39,066	2	10	£70,437	2 4
Cr.					
Balance from revenue account				£70,437	2 4

DUNDEE GAS COMMISSION.

Annual Financial Statement—Reduction in Price.

In the Journal for the 11th ult., a few items were given from the accounts of the Dundee Gas Commission for the year ending April 30, and our Edinburgh Correspondent, in his "Notes" last week, briefly referred to a statement, prepared by Treasurer Nicoll, which was read at the annual meeting of the Commission on the previous Wednesday. This statement is very interesting; and we are now able to give some additional particulars from it, which we were precluded from doing last week owing to the crowded state of our columns.

Alluding in the first place to the revenue account, the Treasurer stated that there was a surplus of £1270 to meet the debit balance of £1356 with which the year was commenced, and which was now reduced to £86, and this with the price of gas at 2d. per 1000 cubic feet less than the previous year—representing in itself a saving of £3000 to the gas consumers. As to loan capital, £2712 was paid off; thus reducing the capital debt to the sum of £149,903. He explained in regard to this account that, as mortgages fell due, they were now in the position that they could pay them off without replacing them; but the sinking fund was now so large that it was a matter for consideration whether they should not give notice that they were prepared to redeem a considerable amount of the mortgages. The objection to this hitherto had been that, by such operation, they reduced their borrowing powers; but as the borrowing power was still considerable, with no near prospect of a large addition to capital, he intended to ask the Finance Committee to consider the question at the next meeting. One of the most gratifying statements the Treasurer had to make was as to the additional consumption of gas. Not only was the consumption the largest since the commencement of the Commission, but in no single year has the increase acquired the same proportion. In 1887-8, 386,096,900 cubic feet were delivered; and last year this quantity was exceeded by 21,244,200 feet—making a total delivery of 406,341,800 cubic feet. He remarked upon the low percentage of leakage, and said that it reflected the highest credit on Mr. J. M'Crae's management. Consequent on the large increase in the consumption, the revenue turned out considerably larger than the estimate. The gas and meter rental was estimated at £64,566; whereas the actual receipts were £66,735—an increase of £2169. The revenue from chemical products was computed at £4750; the actual amount being £5277 5s. 8d.—an increase of £602. Against these increases had to be placed a large falling off in the revenue from coke; this branch producing only £747—not much more than half the receipts of former years. But this was accounted for by the use of non-coking coals for gas making. The total revenue from all sources was £73,154. Concerning expenditure, the Treasurer pointed out that, to produce £2169 of extra revenue the coal account had increased by only £1063. It was estimated that 36,448 tons of coal would be required to produce 390 million cubic feet of gas; and 406 million feet were manufactured with 37,326 tons—that was, the increase of 14 million feet were produced with 878 tons; whereas 1495 tons would have been required had Mr. M'Crae not been able to produce 10,892 feet per ton, instead of the estimated production of 10,700 feet—thus saving on the coal account upwards of 600 tons. Consequent upon the increased consumption, the different items relating to manufacture were higher; and here the Treasurer mentioned that new purifiers were in course of construction, which would materially reduce the cost of purification. The interest account was getting substantially less year by year. Three years ago the charge was above £6000; and this year it amounted to only £5400—a saving of £600 a year. The total expenditure, including the debit balance of £1356, amounted to £73,241. The sinking fund had now accumulated to the substantial amount of £28,396, in consequence of the Committee having to take from revenue the large sum of £7500 yearly, and place it to the credit of this account. The gas-stove business was less in the past year than in the preceding one; producing only £113. In framing the estimates for the current year, the Committee reckon upon an expenditure of £72,454, which includes the debit balance of £86. Last year's coal cost on an average 15s. 9d. per ton, to which had to be added firemen's wages, breaking, haulage, &c.; bringing the price up to 18s. 11¾d. The contracts this year, Treasurer Nicoll said, had been made on much the same terms as last year; averaging 15s. 7¾d. They estimated for a production of 420 million cubic feet, which would require 39,252 tons of coals. They based the estimate on producing 10,700 cubic feet per ton; whereas last year the production was at the rate of 10,982 feet; and should they obtain the same result this year, the requirements would be met with a correspondingly less quantity. They calculated that there would be an increase in the consumption of 14 million feet this year; and that coal would cost £37,003. Last year the property of the Commissioners was assessed on a valuation of £24,000; this year, on account of the net revenue being £2000 less, the assessments would be proportionally less, and which they put at £3650. The valuation of the works, Treasurer Nicoll pointed out, was very high; reaching about 11 per cent. on the structural value, and contributing almost £4000 in relief of the rates. The charge for interest they expected to meet with £5200; being £200 less than last year. To meet the expenditure, the Committee reckon upon a revenue of £72,674. They calculate upon receiving £65,911 from the gas and meter rents; from chemical products, £5550, a small increase on last year; and a slight increase from coke, coal waggons, and gas-stoves respectively. It is estimated that the year will close with a surplus; and should the estimates be realized, there was, the Treasurer said, a fair prospect that the price of gas in Dundee need not be higher in future than 3s. 6d. per 1000 cubic feet, which, with 5 per cent. discount, brought it under 3s. 4d. net for gas of an illuminating power of 26 candles. Having complimented Mr. M'Crae upon the successful working of the undertaking, the Treasurer concluded by proposing that the price of gas in Dundee be fixed at 3s. 6d., subject to the discount mentioned, if paid within 28 days after the accounts were rendered. In the few remarks which were made by members at the close of the reading of the statement, satisfaction was expressed at the position of the finances and the efficient condition of the works. The report was adopted; and the recommendation as to the price of gas agreed to.

THE LONDON COUNTY COUNCIL AND THE COAL DUES.

At the Meeting of the London County Council last Tuesday—Lord Rosebery presiding—the Parliamentary Committee reported on the subject of the coal dues as follows:—"The attention of your Committee has been drawn to the Coal Duties (London) Abolition Bill, which has recently passed its second reading in the House of Commons, and which is for the purpose of abolishing any rights or claims of the Corporation of the City of London to levy coal dues after the 5th of July, 1889, when the statutory duties under existing Acts expire. The Bill has now been referred to a Committee, with an instruction to inquire whether, in consequence of the abolition of the Dues, there should not be granted to the City for any, and, if so, what period, a new and further statutory coal tax of 4d. per ton to be levied over the districts outside, including the whole county of London. Your Committee recommend—'That the Council do protest against the question of the further imposition of the coal tax being referred to a Committee of the House of Commons, before which the City Corporation, who are to levy the tax, are able to appear by Counsel, whilst the London County Council, representing much of the district that would have to pay the tax, is precluded by the Local Government Act from expending money for such purposes.' Your Committee also recommend—'That the Council do protest against any action being taken by Parliament with reference to the alleged claims by charter or prescription of the Corporation of London to levy duties upon coal, until the legal right of the Corporation to such duties has been established by the decision of a Court of Law; and, further, that in the event of any right of the Corporation to levy duties upon coal being established, the Council should submit that such right should be dealt with by Parliament in the session of 1890 in such way as may seem just.'"

Mr. C. Harrison (Chairman of the Parliamentary Committee) moved the adoption of the report, and stated that, in accordance with a previous decision of the Council, the Committee had taken the opinion of Counsel, who had advised that the Council had no legal power to spend any funds merely in support of the Bill. They could not appear in opposition to the Bill, because it had for its object the abolition of the coal and wine dues. But the Bill had now been referred to a Select Committee to inquire into the title of the claims of the City. The Corporation could expend their funds in advocating the views of the City. The Council, on the other hand, by reason of the provisions of the Local Government Act of last year, were unable to employ any of their funds for witnesses or Counsel to represent their views before the Select Committee. This was a state of things from which, he ventured to think, the Council would disagree. Therefore the Committee thought the Select Committee of the House of Commons ought to have their attention drawn to the fact that the Council were prevented from appearing before them. The utmost they could do was what the Committee had suggested in the first recommendation. The Committee had further recommended that the proper tribunal before whom to investigate the alleged claims of the City was an ordinary Court of Law. If the alleged legal rights of the City were to be investigated, it could not be so effectively done by a House of Commons'

Committee as by an ordinary legal tribunal. Under those circumstances, he asked the Council to approve of the recommendations in the report.

Mr. R. C. Antrobus proposed the following amendment:—"That the reference now open before the Hybrid Committee of the House of Commons is the best method available, under the circumstances of the case, for investigating the legal claims of the Corporation of the City of London in regard to the coal dues after the 5th of July, and its claim, as a matter of equity, that the balance still owing to the Holborn Valley improvement should be repaid to it." He said it was only the other day that the Council petitioned Parliament in favour of abolishing the dues, and now they wanted to raise the question again. The 5th of July was close upon them; but in the meantime there would be great confusion, because anyone having to do with contracts in which coal was one of the articles would be landed in the dilemma—having two prices mentioned—one supposing the dues were continued, and one supposing they were abolished. Therefore a large industry was placed in a state of some jeopardy. He could not imagine any more practical way of dealing with the question than leaving it exactly as it was—in the hands of a well-chosen Committee of the House of Commons.

Mr. J. Beal went at length into the history of the coal and wine dues to prove his contention that the dues ought to be abolished. The Corporation, he said, were allowed a privilege which was not accorded to the County Council—they were allowed to have in the lobby of the House an officer, known as the Remembrancer. He (Mr. Beal) maintained that the Council should stand upon equal terms with the Corporation; and that in the discussion of the Bill before the Committee, where a great legal question was to be tried before a tribunal not legal, they should not be excluded. He hoped the Council would not only pass the Committee's recommendations, but would support every step of the Committee in asserting their rights.

Sir J. Lubbock ventured to hope the Council would not re-open the whole question of the advisability of the coal dues; for they had discussed it, and expressed an opinion upon it. The matter now before them was what, if anything, it was wise for the Council to do under existing circumstances. The Council would have to co-operate with Parliament—they would have to go over and over again before the House of Commons; and surely it would be very unwise of them to set themselves in opposition to Parliament. They had already expressed their views on the subject of the coal dues; and surely the wise and dignified course would now be to leave the matter to the wisdom of Parliament, who would consider the subject in accordance with the justice and equity of the case.

Mr. Lawson, M.P., deprecated any attempt to re-open the question as to the justice or expediency of the coal tax. What they had to consider was whether it was wise, now that a Parliamentary Committee was actually considering the matter, to pass a resolution such as they were asked to accept. What was the use of protesting against the action of Parliament when it had appointed a Committee to consider the matter? That Committee would be thoroughly impartial and wise in its decision; and therefore he submitted that it was unwise to pass either of the resolutions before the Council.

Mr. J. B. Firth, M.P., said the situation was serious, and the question a most difficult one. It was a very serious thing if that Council—representing as it did the major portion of the area in which the rate was levied—were not permitted to be heard at the inquiry before the Parliamentary Committee. There was no doubt that Parliament would not abolish any valuable right without some sort of compensation; but it would surely be an extraordinary issue if, after the report of the Committee, it was decided that the statutory dues were to be re-enacted for a considerable period without the Council having an opportunity of saying something against it. He had brought this fact before Parliament, and had received considerable support; and there was a strong feeling on both sides of the House.

Mr. H. H. Marks submitted that there were numerous difficulties in the way of bringing the question into a Court of Law. The Council was not in the position of a defendant, and could not make itself a plaintiff. The fact of the case was that Sir Joseph Pease, after much pressure, and with a great deal of foresight, had anticipated a possible evil in the future; and therefore had himself brought this question before the House of Commons. He (Mr. Marks) was very glad indeed that it was before the House, because he considered that it would be dealt with as fairly and justly there as though it had been before a Court of Law, if it were possible to bring it there. He thought they were perfectly safe in leaving the question in the hands of the House of Commons Committee.

Sir Walter De Souza moved—"That the question be now put."

The Chairman thought that as the question had been before the Council on three occasions, members had better refrain from entering into a discussion as to the advisability of continuing the dues, and strictly confine themselves to the question raised in the resolution, if the subject were discussed further.

The amendment having been negatived, Mr. B. F. Costelloe moved a further amendment, as follows—"That the London County Council, representing much of the district which would have to pay any coal tax, being precluded by the Local Government Act from expending money for the purpose of preparing and supporting a legal case against the City claim, is of opinion that no alleged claims to take the coal dues by charter or prescription of the City of London ought to be assumed unless affirmed by a decision of a Court of Law; and in the event of any such rights being established, the Council hopes that the right will be dealt with by Parliament in the session of 1890, in such a manner as may seem just; and re-affirms its protest against the claim now preferred by the Corporation in respect of the Holborn Valley improvement." He said this amendment would, if accepted, have the effect of carrying out the recommendations of the Committee without injuring, offending, or in any way hurting the feelings of the House of Commons. Certainly some notice should be taken of the fact that whilst the City in urging its views, could spend thousands of pounds, the Council could not lay out a penny in support of its view.

Mr. Westacott seconded the amendment, and it was declared to be carried.

Mr. Harben then moved an amendment to adjourn the debate until after the Committee of the House of Commons had reported.

This, however, was negatived; and Mr. Costelloe's amendment carried.

The Northern Coal Trade.—In consequence of local holidays, there has been a good deal of interruption of the output of coal during the past few days, and there has thus been greater scarcity both of steam and of gas coal. Steam coal is very steady, at about 9s. 6d. per ton for best Northumbrian qualities; second kinds being 6d. per ton less, whilst for small coal there is a good demand at about 4s. For gas coal there is an extraordinary demand for the season; and though 8s., less 2½ per cent., is the price free on board in the Tyne, little can be sold at that price, as there is the fulfilment needed of old contracts at, in some instances, 1s. 6d. per ton less, which must reduce the average very greatly. It seems certain that there will shortly be the concession of an advance in wages to the miners.

PLYMOUTH AND STONEHOUSE GAS COMPANY.

The Annual General Meeting of this Company was held last Thursday—Mr. G. Henderson in the chair.

The report presented by the Directors for the year ending the 31st of March last stated that after paying the authorized half-yearly dividend in January last, the sum standing to the credit of profit and loss amounted to £27,997 3s., out of which it was recommended that a dividend of 12s. 3d. per share on the original shares, and 9s. 9d. per share on the additional shares, free of income-tax, be declared for the half year ending March 31 last; being at the rate of 12½ per cent. on the original shares, and 9¾ per cent. on the additional shares.

The Chairman, in moving the adoption of the report and accounts, said the quantity of gas sold for the year was 496 million cubic feet; while in the previous year it was 475 millions—showing an increase of 21 million cubic feet during the year. The receipts for gas were £44,846 9s. 7d., compared with £43,623 2s. 8d., or an increase of £1223 6s. 11d. The shareholders would doubtless recollect that the price of gas for six months of the previous year was reduced from 1s. 10d. to 1s. 9d. per 1000 cubic feet, representing a loss of revenue amounting to about £700; so that they had not only made good this reduction during the past year, but had an increase besides of £1223 6s. 11d. The receipts for residual products amounted to £14,527 19s. 7d., as against £13,239 7s. 1d. in the preceding year; showing an increase of £1288 12s. 6d. Their total receipts were £63,046, against £60,660—an increase of more than £2300, which he thought would be regarded as exceedingly satisfactory when they took into consideration the loss of revenue arising from the reduction in the price of gas. The coals had cost £32,470—an increase on the previous year of £3566. This had arisen partly from the increased quantity of coals they had required; but principally owing to the increased freights they had had to pay during the last six months of the financial year. There had been a general rise in freights all over the country; and the Company had, of course, felt the effects of it as other industries had done. The total expenditure had been £52,716 9s. 5d., against £50,230 10s. 8d. last year; leaving a balance of £10,329 11s. 6d. available for dividend, as against £10,426 15s. 7d. in the previous year. This showed a decrease of only £97 4s. 1d.; and considering that they had had to pay higher freights and made a loss in revenue of above £700 through the reduction in the price of gas, he thought the shareholders would admit that the statement of accounts was a very satisfactory one. Referring to the articles which have lately appeared in the Journal on the "Board of Trade Returns relating to Authorized Gas Undertakings," the Chairman remarked that the returns showed that the lowest prices charged for gas were to be found at Plymouth, Newcastle-on-Tyne, Gateshead, and Sunderland (varying from 1s. 9d. to 2s. per 1000 cubic feet), and that Plymouth paid 12½ per cent., Newcastle-on-Tyne 9 per cent., and Gateshead and Sunderland 10 per cent. But he thought that when it was borne in mind that Newcastle and Sunderland were close to the coal districts, and that Plymouth was able to supply gas at a lower price than these Companies, and when it was borne in mind also that the Plymouth Company had to pay £15,000 a year in freights which the other Companies were not subjected to, it must be clear that the policy pursued by the Plymouth Company from its formation up to the present time had been, he might say, entirely in the interests of consumers of gas in the town. The fact that 1d. per 1000 feet meant more than £2000 per annum to the consumers, whereas the extra dividend of ¼ per cent. represented only about £200 a year, justified him, he thought, in saying that no one could reasonably complain of the shareholders participating in this small increase. Alluding to the recent agitation in connection with water gas and to the progress of electric lighting, the Chairman quoted the opinion expressed by Mr. W. Foulis (as given in our columns) as to the cost of production of water gas amounting to 1s. 9d. or 2s. per 1000 cubic feet; while with respect to electric lighting schemes, he said he did not consider the reports were very encouraging. He did not think there was any very great inducement to the shareholders in the Plymouth Gas Company to part with their shares with the view of investing their money either in water gas or in electric lighting companies. The whole of the works of the Company, he was glad to state, were in an efficient condition, and would, he ventured to say, bear favourable comparison with any other works of the kind in the country.

Mr. R. H. Snow seconded the motion, and it was agreed to.

The dividends recommended in the report were then declared; and the retiring Directors and Auditors having been re-elected, the thanks of the meeting were accorded to the Chairman, Directors, and staff (Mr. J. Thomas, the Secretary, and Mr. J. T. Browning, the Engineer, responding for the latter), and the proceedings closed.

HUELVA GAS COMPANY.

The Directors of this Company have submitted to the shareholders the balance-sheet and profit and loss account for the year ending the 31st of March. Their report states that the consumption of gas steadily increases, additional lights being employed, and more meters being on hire. Recently the Secretary (Mr. W. Simpson) spent some time in Huelva; and on his return submitted to the Directors a report upon the state of the works, also his verification of the stocks and outstanding accounts, and on the prospects of the Company. The report was considered highly satisfactory. Mr. C. W. Adam, the Manager in Huelva, after nine years' residence there, was granted a holiday last summer, when he came to Glasgow. He had various conferences with the Directors, and visited several gas-works in Scotland and in England, and reported thereon. The report goes on to say that the regenerative system now adopted at some of the gas-works in this country, practically does away with the use of coke for heating the ovens; leaving the whole of the production for sale. As the demand for coke in Huelva is increasing, the Directors, after careful consultation with experts, have decided to adopt this system; and the necessary plant is now being prepared.

They trust that the current year will benefit from the change, as the sale of coke has always been a considerable source of revenue to the Company. Tar met with a ready sale during the year at the price to which it had been reduced; and the probabilities are that this free sale will continue. The works, plant, pipes, services, &c., are all reported to be in good order, and have been well maintained from revenue during the year. Nearly all the meters on hire (of which there are about 370 owned by the Company) are comparatively new, and the stock on hand in the works, amounting to £191, is represented by new meters; all the old and doubtful ones having been expunged from stock by the amounts written off in 1887 and 1888—in all, £450. The meters on hire produce a good revenue (for the past year it was £139 11s. 8d.); and a moderate writing down from year to year will keep this item in a healthy condition.

In regard to the capital, the property account stands at £24,151 16s. 6d.; being £2030 6s. 2d. more than last year. This addition is accounted for by the payments to complete the new gasholder, new buildings, extensions, telephone from the town to the works, &c. Further expenditure will be necessary during the current year for forming a brick boundary wall round the works, required by the spreading out of the population

making railway siding and store, and other additions. The railway siding will, it is expected, effect some economies in the carriage of coal to the works.

During the past year there were advances both in the prices of coal and in the rates of freight, which increased the cost by about £155. Various economies have, however, been effected; and the profit and loss account shows a balance on the 31st of March last of £2825 0s. 10d. From this amount the Directors feel justified in recommending the distribution of a dividend of 7 per cent. free of income-tax, payable one-half on the 28th of August next, and the other half on Feb. 28, 1890, which will absorb £1750; that £350 be added to the reserve fund, bringing it up to £2850; that £100 be written off the meters-on-hire account; and that the balance of £625 0s. 10d. be carried forward to the next accounts.

The Company's authorized capital consists of 2500 shares of £10 each, all of which have been issued and paid up; making £25,000. The balance-sheet shows that £593 1s. 4d. is due to sundry creditors in this country; that the bills payable amount to £81 13s. 9d., and that the reserve fund and balance bring up the total capital and liabilities to £31,199 15s. 11d. The dividend has ranged from 3 per cent. in 1881-2 to 5 per cent. in 1882-4, 6 per cent. in 1884-5, 6½ per cent. in 1885-8, and 7 per cent. in 1888-9.

With reference to spent lime, the Secretary states in his report that there are at the works about 500 tons, which stand in the accounts at a merely nominal figure. But considerable attention is being given to agriculture by some people in the neighbourhood of Huelva, who are disposed to adopt all the newest agricultural methods known; and one of the Company's shareholders, who has a large estate, is at present having some experiments made which will probably result in his taking up all the spent lime produced at the works. Mr. Simpson also reports that arrangements are being made to open a shop in Huelva to show the latest improvements in gas-fires and other appliances for utilizing gas; and this may result in increased consumption later on. There are several towns within easy distance of Huelva, and about the same size as it was when the Company began their operations there, which are showing indications of a desire to be lighted by gas; and it is anticipated that the Company may find it desirable and profitable to extend their operations to these towns.

At the annual meeting of the Company, held in Glasgow last Friday afternoon—Mr. G. F. Ross, Chairman of the Company, presiding—the Directors' report was unanimously adopted.

EXHIBITION OF GAS APPLIANCES AT CROYDON.

From Tuesday to Saturday of last week, the Croydon Commercial Gas Company held an exhibition of gas-fittings and appliances in the large and small Public Halls. The opening ceremony was performed by Mr. Charles Gandon, M. Inst. C.E., the Engineer of the Crystal Palace District Gas Company, on Tuesday afternoon, when the number of persons present far exceeded the expectations of those who had in hand the arrangements for the occasion.

Mr. Gandon, in his address, which was brief and to the point, spoke in the first place of the object of gas exhibitions. He believed the main purpose of them was to induce people to burn more gas, and to cause people to use it who were not already consumers. This he hoped would not frighten people who considered their bills already higher than they ought to be. But he might say that the Directors of the Company, being such sound business men, although they wished to increase the prosperity of the Company, did not desire to do so at the expense of the consumers—in fact, what they were trying to do was to show how the gas could be used to the best advantage. He then referred to the great progress which had been made in late years in inventions for utilizing gas. Not only was gas used for heating, cooking, and motive power, but it was now employed to make electricity. It was surprising, he continued, what waste of gas he found among consumers, either from defective fittings, or by not properly looking after the gas. If they wished to economize, they must look after the gas themselves, and after their servants too. In the matter of burners—for after all these were the cause of the greatest waste—in the exhibition would be found burners capable of giving five or six times as much light as some of the old-fashioned ones, for an equal consumption of gas. He did not wish to condemn all the older types of burners; and he did not say that they should use exclusively high-power burners. But he recommended all consumers to select the best burners, even regardless of expense. He knew from experience that they would soon repay the purchasers, even if they cost a little more in the beginning. Another point which was frequently overlooked was that of pressure. Gas companies, on account of the difference of the levels in their districts, could not supply everybody with gas at a pressure which was suitable for all purposes; and therefore it was very desirable that some means of automatically regulating the pressure should be used in every house. Mr. Gandon proceeded to make a few remarks upon that much-abused instrument the gas-meter, which, he said, was thought by some to be a box of mystery, specially provided to confuse and defraud the consumer. It was nothing of the kind. It was a simple and most reliable instrument. He did not claim for it that it was infallible; and he thought there was hardly anything in this world which was. It required watching like everything else. He strongly urged consumers to learn to read the index, so that they could ascertain what gas was being consumed. Cooking by gas was what gas companies were advocating now for the purpose of extending their businesses. It would not be necessary for him to dilate upon this branch of his subject as a series of lectures would be given by Madame Alting-Mees, who was far more able to explain it than he (Mr. Gandon) was. He would only say that gas was the most comfortable and economical means of cooking. To be economical, however, the stove required some attention. He had frequently seen in a kitchen a large gas-stove lighted to heat a kettle of water, which could have been done on a small gas-fire without any appreciable expense for gas; and under such circumstances, gas was not economical. In conclusion, he declared the exhibition open; and expressed the hope that it would be successful, and prove interesting and instructive to the visitors.

A vote of thanks was passed to Mr. Gandon for his kindness in opening the exhibition, on the motion of the Chairman of the Company (Mr. Charles Newton), seconded by Mr. Bertey, one of the Directors.

Regarding the exhibits, the attention of the visitors appeared to be chiefly centred on the suite of rooms which were splendidly furnished by Mr. A. C. Ebbutt, of Croydon. The drawing-room was lighted by Messrs. W. Sugg & Co. with side bracket lights; the dining-room by a Wenham ventilating light; and the bedroom by ordinary burners, provided; by Messrs. Wenham & Waters (a local firm), with an electrical arrangement for turning the gas on and off. The rooms were all supplied with stoves by Messrs. T. Fletcher & Co., of Warrington. There was also a billiard-room, fully equipped, which was lighted by three Wenham lamps. High-power and ordinary gas-burners were present in full force. Besides the Wenham lamps already mentioned, Messrs. Sugg exhibited specimens of their well-known burners and the "Cromartie" lamp. Messrs. Henry Greene & Son's new "Meteor" lamp attracted much attention, and their illuminating capabilities were well exhibited in the lighting of the lecture and engine rooms. The Schülke Lamp Company had a number of their lamps on view in a prominent position, and they were also shown in operation in one of the corridors. A number of lamps and fittings were also exhibited by Mr. T. J. Drake—a local manufacturer. Respecting heating and cooking stoves, boiling rings, &c., Messrs. H. and C. Davis and Messrs. T. Fletcher & Co. displayed examples of the various wares for which they are noted; and in the same class, Messrs. Wenham & Waters had on view a huge cooking-range, which had a well-finished appearance. Gas motors were only represented by a small "Otto" engine (which was shown driving one of Savage's coffee-mills), and one of Messrs. Andrew & Co.'s ¾-horse power "Stockport" engines. Messrs. Carter & Lees, through their local agents (Messrs. France & Sons), had on view specimens of their patent safety gas-governor. Much interest was evinced by visitors in the numerous aniline dyes and other products from coal tar exhibited by Messrs. Forbes, Abbott, & Lennard. The lectures on "High Class Cooking" in the afternoons, and on "Every-Day Cookery" in the evenings, by Madame Alting-Mees, were well patronized. We understand the exhibition was very successful, and to a great extent this was due to the lively interest taken in it by the Secretary of the Company (Mr. W. J. Russell) and the Engineer (Mr. J. W. Helps).

BIRKENHEAD CORPORATION GAS SUPPLY.

A Scheme for Supplying Gas-Fittings on the Hire-Purchase System.

About two months ago, the Gas Engineer of the Birkenhead Corporation (Mr. T. O. Paterson) submitted to the members of the Gas and Water Committee a scheme, prepared by him in conjunction with Mr. J. Birnie (who has charge of the financial business of the Gas and Water Department), for supplying gas-fittings on the hire-purchase system. It appears that there are in Birkenhead about 1200 tenanted houses which are fitted with gas service-pipes, but of which the occupiers use oil for lighting purposes; and the scheme of the above-named gentlemen was formulated with the idea that if it was adopted a large portion at least of these people might be induced to become gas consumers, and existing consumers be led to use gas more liberally. There was nothing specially novel in the proposals, which were the outcome of their experience of the hire-purchase system in connection with gas-cooking stoves, and was simply an extension of that system, which is generally adopted throughout the country, to the profit of owners of gas undertakings, and the comfort and convenience of consumers. Inquiries set on foot prior to drafting up the scheme revealed the fact that the cost of the necessary fittings having to be paid at once deterred many of the occupiers of the better class of cottage houses from using gas; but as, by spreading the expense over a series of years, payment would be made easy, Messrs. Paterson and Birnie suggested that occupiers of good cottage houses should be supplied with the necessary fittings on the three-years' purchase-hire system. This plan was considered best, as it gives the hirer a personal interest, secures a permanent customer for gas, and obviates the necessity for investing a large sum in fittings which would have to be heavily depreciated annually. It was thought that prepayment meters, as soon as their success became assured, might be brought into use, in connection with the scheme, for the smallest class of the consumers. The report concluded with the following definition of the scope of the scheme:—"The object is to work a business that does not now exist; and it cannot be fairly contended that we are entering into competition with private tradesmen, as dealers in gas-fittings do not, and are not likely to, sell their goods on the purchase-hire system, while the custom we are endeavouring to gain could not be obtained by any other means." The number of houses assessed at £18 and under supplied with gas in Birkenhead, Claughton, and Tranmere is 1901; their weekly rentals ranging from 4s. 6d. to 10s., and the revenue derived from them being £2795. The amount of bad and doubtful debts written off in the year ending March 23 last for gas supplied to houses assessed as above-named was £30 1s. 11d. The deposit system was abolished in September, 1881, since which date seven months' credit has practically been given to the consumers, except in a few cases. Gas is used in but few cottage houses as compared with the total number of such houses in the borough; yet the consumers are sufficiently numerous to show that the business done with this class is remunerative even without deposit. It was suggested that one quarter's hire should be paid at the time when the order was given; and the agreement between the parties was to stipulate that the hire should become due quarterly in advance, and that the balance of the purchase-money should be paid before the fittings could be taken out of the district. Accounts were to be collected quarterly, though the hirer was to be at liberty to pay monthly instalments if more convenient. In case of default in payment, the Corporation were to have power, under the agreement, to enter upon the premises and remove the fittings after giving 24 hours notice. It was expected that difficulties would arise in working the scheme; but the powers possessed by the Corporation under their Act of 1881 and the Gas-Works Clauses Acts would, it was believed, reduce them to a minimum. The houses which it was proposed to bring on to the books are situated in streets where mains have already been laid and gas is supplied to occupiers of the same class; and the fittings to be put in were to comprise a meter, a 2-light chandelier and globes, a griller and boiling-stove with tin kettle, a cork-slide pendant for the kitchen, and a single bracket for the bedroom, with the necessary main tap, meter-shelf, and piping to connect the meter. The rental for these fittings was to be 3s. 3d. quarterly, or 1s. 1d. monthly for three years, at the expiration of which time all (with the exception of the meter) would become the property of the purchaser. The payment of the above-named amounts was to cover all expenses except the small sum of 4d. per quarter during the period the meter was in use. The new business sought to be obtained would not have caused any increase in the cost of distribution, collection, &c., as the collectors and inspectors passed the places on their rounds; while it was estimated that it would yield a profit of about £100.

On the general proposals embodied in the scheme becoming known, considerable objection was raised to it in the local press. It was contended that the scheme would not only interfere seriously with the business of private tradesmen, but would be inapplicable on account of the migratory nature of the class to whom it was proposed to be applied. With this preparation, the members of the Town Council approached the discussion of the matter when it came before them. The Chairman of the Gas and Water Committee (Alderman Rawcliffe), in moving the adoption of the Committee's minutes remarked that the proposal might be considered in some respects a new departure; but it was not a gigantic one, and was an experiment the Corporation might fairly try. Some time ago they had had considerable difficulty in getting members to agree to the suggestion that gas-stoves should be let out on hire. But the result of trying that experiment showed, from calculations on a proper basis, that since 1884, when the permission was accorded, the result in the actual supply of gas was a gross profit of £3000. Apart from this the gas had been supplied without extra expense; for they were enabled thus to utilize their mains in the daytime, when otherwise they would not have been occupied. In order to prove this, he quoted figures to show that in

1883 the day consumption of gas in the summer quarters was about 10 per cent. of the whole, and in the winter quarters about 26 per cent. of the whole. In 1888 the consumption in the summer quarters during the day was 18 per cent., and in the winter quarters 29 per cent. Under these circumstances, he thought they might try the new experiment; for even supposing they were not successful, they would lose very little by giving it a trial. Mr. Shaw moved as an amendment that the proceedings of the Committee be not confirmed. He expressed the belief that the Committee could not engage in the proposed enterprise without great loss to the Corporation. A man fitting up his house would, he said, pay an amount which would cover a certain length of time. At the end of that time, when the inspector went to receive the second payment, he would find the house to let, and the fittinge gone. No one would know where the people had gone to. Gas-fittings were now so cheap that any person wishing to use gas could purchase them more reasonably than the Corporation could supply them. Mr. Benedict Jones said no one was more opposed than himself to corporate or governing bodies having anything to do with trading concerns; but they had the gas-works, which was a vast institution for trading, and it could not be carried on successfully unless worked on trade principles. They must push the sale of their gas and other products just as a private company would enter into competition with them. The people whom it was proposed to benefit were ratepayers, and therefore had a right to anything the Corporation could do for them; but whenever the Gas and Water Committee tried to do anything, they were always met with objections. They never heard any one object to the new slaughter-houses, although they were in opposition to private tradesmen, inasmuch as they prevented people from having private slaughter-houses. Mr. Delany said the gas and water works belonged to the ratepayers, and should not be used as a means for competing with them. He contended that unless the Gas Committee were also prepared to supply houses with a rental of £40 per annum, their proposals savoured of class legislation, which should at all times be discouraged. Alderman Willmer thought the scheme had not been sufficiently considered by the Committee; and he asked the Council not to pass the resolution until such time as the Committee were prepared to bring forward evidence showing that there was some prospect of the anticipated advantages being realized. After some considerable discussion, the amendment was carried by 24 votes against 13 votes for Alderman Rawcliffe's motion. The proposition was therefore rejected.

THE LONDON CHAMBER OF COMMERCE AND ELECTRIC LIGHTING.

A Meeting of the Electrical Trades Section of the London Chamber of Commerce (the formation of which has been mentioned in our columns) was held at Botolph House, E.C., last Tuesday—Mr. R. E. Crompton in the chair.

A report was presented setting forth the progress made since the appointment of a Committee in November last. It stated that with regard to the Board of Trade regulations as to accounts, it was urged upon the Board not to issue any general regulations applicable to all undertakings until the companies had had two years' working experience. On the subject of electrical measuring standards, the Committee had co-operated with the Institution of Electrical Engineers; and they had laid their views before the Board of Trade. Representations had also been made to the Board that it was desirable that there should be a change in the existing standard of light as defined by Act of Parliament, so as to secure a reliable standard of photometrical work. A Committee had been appointed to consider the question of overhead wires; but not having seen the rules, a suggested deputation to the Board of Trade was postponed. This and the question of standard specifications were referred to Sub-Committees.

The Chairman, in reviewing the work of the section since its formation, said that among the recommendations of the Electrical Supply Sub-Section was one to endeavour to secure that the Board of Trade unit should be increased from 1000 to 10,000 watt-hours. This was noticed in the Provisional Orders; but, for some reason or other, the Board of Trade did not see fit to carry out the recommendation. Although this was not a matter of the greatest importance, it would certainly have been an improvement. The next matter which came before the Committee was a recommendation that there should be united action on the part of electric lighting undertakers declining to pay the legal expenses of local authorities when it was proposed to do so. This was a very good recommendation; and he hoped it had had some beneficial effect. Although they could not bind persons, he was glad to say that there had been a general refusal on the part of undertakers to pay the heavy bills which some of the local authorities had sent in. Another recommendation of the Committee was to urge all electrical supply companies to decline to sell their undertakings in a shorter period than 42 years. He believed this point was brought forward because of a suspicion that two or three of the supply companies were going behind the backs of the others, and offering to agree to the old period of 21 years. The result of the passing of the Committee's recommendation was to nearly put an end to the steps taken by those companies. The next recommendation was that the companies should require two years as the minimum period for which compulsory works should stand. He did not know what had been the effect of this.

Mr. Wallace said he believed it was two years in the Order.

The Chairman then said that the Electrical Supply Sub-Section, having at another meeting considered the Board of Trade regulations as to accounts, recommended the Committee to request the Board not to issue any general regulations applicable to all the undertakings until the companies had been at work for a period of about two years. He was not aware that the Board had pressed for the accounts; and he believed they had acted upon the hint of the Committee. The next Committee that got to work was the Electrical Measuring Standard Committee, which, at the beginning of the year, met to consider the question of a measuring standard. They decided to confer with the Institution of Electrical Engineers. A Committee of both bodies was appointed; and when the two Committees began to work, it was decided to have a joint deputation to wait upon the President of the Board of Trade on the subject. In furtherance of this, an estimate was prepared by the Committee of the Institution of Electrical Engineers as to the least sum that would be required for establishing a laboratory. With this information in their hands, a deputation waited upon the Board of Trade, and met with a favourable reception (see last week's Journal, p. 1176). There was every reason to think there would be a standardizing laboratory; and if this was achieved, it would be one of the results of the establishment of the Electrical Trades Section of the Chamber of Commerce. The question of a reliable standard for photometrical work was also discussed; and it was decided to urge upon the Board of Trade that it was most desirable that there should be a change in the existing standard of light. It was resolved to write to the Board of Trade to the effect that the candle was a very unreliable standard, and that Mr. Vernon Harcourt's pentane standard should be adopted. The letter had been acknowledged; but up to the present he did not know what had been the result.

On the 14th of February the question of overhead wires came up; and a Committee was appointed to consider the subject. A meeting was held in April at the Westminster Town Hall for the purpose of considering a communication from the President of the Board of Trade, who wrote that he would receive a deputation. But a copy of the rules had not then been obtained; and the electric lighting inquiry was also in progress. The meeting was postponed for a time, in order that they might consider the rules. After some difficulty they had been able to obtain a copy of the rules, which had been criticized by the Committee, and within the last few days various modifications had been suggested. The rules were very good so far as they referred to overhead wires in London; but they had the tendency to make these wires very expensive for rural districts, where such extreme safeguards for the public against falling wires were not so necessary as in crowded towns. The question was still under consideration by the Committee; and, as a matter of fact, the position of affairs was that the Board of Trade rules were still on the table of the Post Office Solicitor. The next subject—as to standard types of apparatus—had made very little progress; no one seeming to be inclined to have a standard. There seemed to be a cordial agreement to have a small screw-thread standard; and the Sub-Committee on this subject had devised a thread which would meet all requirements. The subject of standard specifications also had not progressed much; but the Sub-Committee had it under their consideration, although nothing practical had as yet been decided upon. The question of arbitration had been discussed, and a Committee appointed. It was thought that, as arbitrations on electrical matters were very complicated and required technical knowledge, they could not dispense with professional aid; and whilst adopting the ordinary rules of the Chamber of Commerce as to arbitration, it was decided to add to them the power of employing Counsel in cases where it was thought desirable.

Major Flood Page said a good deal had been done since the Section had been at work. As one great object they had was publicity, so far as the electrical trades were concerned, he moved that a copy of the report be sent to the electrical and engineering papers.

The proposal was adopted.

Mr. Trotter stated, with regard to overhead wires, that the rules of the Board of Trade were not quite so stringent as at first sight appeared, but there were one or two important points worthy of consideration. He had been informed that the whole of the overhead wire question had been handed over to the London County Council. He did not know how true that might be; but he heard that the Council had said already that they would sweep them all away. The rules were to be modified for different areas; and some latitude was to be allowed for the rural sanitary districts.

Major Flood Page urged that in regard to the London County Council's powers it was well to realize the fact that there were many strong indications at the Board of Trade that electric lighting and electricity generally was to be handed over to the new County Councils. One important matter had forced itself upon him. He had to go to Manchester the next day; and an electric company there had given notice for a Provisional Order. He had taken the opportunity of pointing out to the Board of Trade the extraordinary position in which the company would be placed if they were handed over bodily to the Manchester County Council. That Council was coterminous with the Manchester Corporation, who were the owners of the gas-works, and had placed every difficulty in the way of electric lighting in the city. If the councils were to be the sole judges, and if the electric lighting companies had to go to them, and the Board of Trade were to do nothing, there must be an appeal to the Board where the councils and the local authorities were opponents to the electric lighting. Such opposition would, he believed, arise in many places. Several corporations had had Provisional Orders from the commencement, and yet had not done anything up to the present time. The practical question would come up before them of what they ought to do in view of the probability that the electric lighting industry would be handed over to the county councils throughout the country. In London they might get some kind of protection, for the Council had not the gas undertakings in their hands; but in the provinces the matter might become a very serious one.

Mr. Callender stated that in Glasgow they had given notice to apply for Provisional Orders upon a definite statement to preclude others.

Major Flood Page considered it useless to deny that the Board of Trade contemplated shifting the whole thing off their hands. There should be in such cases as that of Manchester a power of appeal to the Board. They were told that Glasgow was going in for the express purpose of preventing the electric light.

The Chairman suggested that the best plan was to watch all these things, as the proper functions of the Section was to memorialize the Board of Trade in all these cases.

Mr. L. Murray, Secretary of the Chamber, confirmed the opinion of Major Flood Page as to the tendency of the Board of Trade to diminish their responsibility of action, and said that the London Chamber had experienced this in several ways.

Major Webber urged the Section to take action as soon as possible, in order to prevent the Model Order being passed in its present form, as it gave the County Council absolute control of all overhead wires, with power to veto them. With regard to testing, it was important to know that the power of the electrical inspector to enter in and test the light of any company was absolutely at his own option; and the company were bound to pay the inspector such fees as the Board of Trade had sanctioned. He did not think that any electric lighting company should submit to such an arbitrary rule as this.

The Chairman thought it would be very difficult to do as suggested. These amongst other things in the Model Order had been considered during the past week.

Major Webber remarked that, with regard to the inspectors, it would be manifestly of advantage to the Council to have a large number; for the more they had, the greater would be the revenue from this source. He suggested that it was quite within the power of the Section to oppose the Bill in Parliament.

Ultimately, the whole question of Provisional Orders was referred to the Supply Sub-Committee for consideration.

Sales of Gas Shares.—Last Wednesday, at the Auction Mart, Tokenhouse Yard, E.C., Messrs. Fox and Bousfield sold at the prices stated below, a number of shares in various Gas Companies, as follows:—*Lea Bridge District Gas Company*, 42 original £10 shares (fully paid), at £22 each.——*Weymouth Gas Company*, 83 £10 shares (£7 paid), maximum dividend 7 per cent., 30 realizing £10 each; 10, £9 10s.; 10, £9 5s.; and 33, £8 15s.——*West Kent Gas Company*, 25 ordinary £10 shares (fully paid), 5 realizing £20 10s. each; and 20, £21.——*North Middlesex Gas Company*, 100 £10 shares (fully paid), 40 realizing £14 each; 30, £13 15s.; and 30, £13 10s.——At a sale by auction last week, some shares in the *Sevenoaks Gas Company* realized the following prices:—One £10 "A" share, £23 15s.; four £10 "B" shares, £16 15s. each; two original £10 "A" shares, £23 10s. per share; five £10 "B" shares, £16 10s. per share; and five "B" shares on which £8 per share had been paid, £13 each.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

It is a year to-day since the Edinburgh gas transfer dispute was brought to a close. I do not know if it is a desire to hold the anniversary of those times of stir and something worse, now happily passed away, that has taken hold of the Commissioners; but there has this week been a return to the active practice of public discussion, and, I am sorry to say, underground movement, which I was in hopes were among the things of which we had seen the last. The ball was set rolling at the Commissioners' meeting on Monday, at which, with one exception, the general business was of a more than ordinarily routine nature, and was transacted in less than ten minutes' time. The outstanding item was a notice of motion for next meeting to ask the Works Committee to consider what attitude the Commissioners were to assume towards the Electric Light and Power Supply Company, whose prospectus I mentioned in my "Notes" last week. Then Mr. Smith Clark, the "stormy petrel" of the last two years' discussions, introduced the subject of the annual accounts, or rather of the publication of the accounts. He took exception to the appearance of a summary of the balance-sheet in the local press before even the Finance Commissioners had been informed of the state of their finances. That was the summary upon which I proceeded in the paragraph in my "Notes" a fortnight ago; and I am now sorry that I mentioned it, because it led me into a train of reasoning not altogether correct. Mr. Smith Clark was, I consider, justified, under the circumstances, in the view he took, that it was prejudicial to their interests to have their affairs prematurely published. Such a thing was never known in the days of the Companies. But then there was no temptation; whereas now a weak Commissioner is inclined to be gracious to an importunate newspaper representative—keeping in view a lively sense of favours to come, when election time arrives, and which illustrates one of the drawbacks of Corporation management. One of their own number had, in this manner, revealed the state of the accounts, when only one or two of the Commissioners were acquainted with them; and he took the opportunity of presenting the position to the public through the newspaper in such a way as to—as Mr. Smith Clark said—hamper their action when they came to consider the accounts. The statement Mr. Smith Clark objected to, I presume, was that meter-rents were to be abolished. Now, it is extremely awkward to have the policy of the Commission foreshadowed, because, if they should decide not to abolish meter-rents, but to accumulate a sinking fund for several years, the Commissioners would certainly be prejudiced in the eyes of the public. Mr. Smith Clark tried to get the offending brother to "own up." But he could not; and the subject dropped. The attempted correction was entirely thrown away. Copies, in manuscript, of the accounts (as made up by Mr. Gibb, the Treasurer) were, on the same day, distributed among the members of the Finance Committee, that they might be able to discuss them at their next meeting; and on the next morning they appeared in full in the local press.* Their publication in this premature fashion, when they are still subject to alteration by the Committee, the Auditor, or the Commissioners, has, I know, given great offence both to the Commissioners and to the officials. Leaving the Commissioners to deal with that question, I proceed with my narrative. A highly favourable balance-sheet having been published, Mr. Smith Clark, on the succeeding day, rushed into print with a long letter of a critical nature—raising some of the old issues. The results were too good for him; and he must needs cut them down. Accordingly, he takes exception to the amount set apart for depreciation—£11,016—as too small; and, reasoning by the analogy of Glasgow, he makes out that it should have been £41,000. He also falls foul of the entry, as an asset, of £22,671 as the cost of law and parliamentary expenses in obtaining the Commissioners' Act, which, he says, should have been taken from revenue, and spread over five years. Adding £30,000 to the repairs and depreciation account, and one-fifth of the law and parliamentary expenses, to the sums set apart for the sinking fund, he brings out a deficit of £3738 on the year's working, which, but for the fact that the Commissioners secured their coal contracts a year ago £12,000 below what they were in the preceding year, he adds, would have been £15,000. Then he objects to the capital account being stated at £462,000, which, he says, is substantially taking the annuities at ten years' purchase; whereas they are selling at 29½ years, and the sum should have been stated at £640,000. To this Mr. Pollard, another of the Commissioners, replied two days later, pointing out that, on the head of repairs and maintenance, the Engineers had a free hand; and all that they considered necessary to expend had been expended, and the net sum had been charged to revenue, and that, on the Glasgow basis, the result would be to give them a new set of works and plant every 6½ years. On the matter of depreciation, he pointed out that Mr. Lass's opinion was that 1½ per cent. was sufficient to set apart; whereas they proposed to allow 2½ per cent. on the value of the plant. On the capital account item, he said the principle they had adopted was not the present market value, which would entail the expense of valuation every year, but the actual sum which they had cost, with the estimated amount which would be required for the three purposes of redeeming the annuities, keeping the works in repair, and providing a reserve and contingency fund. To this letter Mr. Smith Clark replied, but did not break any new ground, and said little of consequence. There is likely to be a fight in the Commission, when the accounts come up for consideration, over the method of stating the capital account, and the disposal of the surplus. These are the points in dispute. The principle adopted with reference to the capital account appears to be a common-sense one. Whether or not it is sound financially, the Auditor will possibly determine. The comparison with Glasgow, or with any other place, is fallacious, because, in the matter of maintenance and depreciation, the circumstances of each place govern the situation. Besides, Mr. Smith Clark should remember that at present about half of the Edinburgh works are under reconstruction, and that, as a consequence, very little was expended during the winter upon the maintenance of the portion which was to be renewed. The accounts for these reconstructions will come into the current year; and he will possibly find, at its close, that a sum sufficient to satisfy him has been expended upon the head of renewals and maintenance. Long as this note is, I cannot leave the subject without referring to the sum charged for law and parliamentary expenses. It has never hitherto been possible to get at that sum, and neither has the full amount yet been stated, because the charge upon the Commissioners only ran from the date of the agreements, whereas the Companies had a heavy expenditure prior to that, and, for aught I know, the Corporations had the same. The sum stated is £22,671. I have several times in my "Notes" referred to it as not under £30,000, which I am now disposed to think is a very moderate estimate; and I am now more than ever of opinion that the transfer was "humbugged" by the attempted smartness of those in charge of it, and that it could really have been accomplished for a much less sum, had a conciliatory instead of a fighting attitude been adopted towards the Companies.

* The accounts appear to-day in another column.—ED. J. G. L.

The Dunfermline Gas Company held their annual meeting of shareholders on Wednesday, when the Manager (Mr. W. Mackenzie) had the pleasure of submitting a report which stated that, notwithstanding the reduction in the price of gas, the revenue had been well maintained. There had been an increase of more than 2½ million cubic feet in the sale of gas; and, with very marked reductions in the working expenditure, results in the highest degree satisfactory had been yielded. The extensions of mains, referred to in last year's report, had been carried out, and still further extension is contemplated. Coal contracts have been secured on favourable, though slightly higher terms than last year. A dividend at the rate of 10 per cent. was declared; and it was resolved to reduce the price of gas by 2d. per 1000 cubic feet.

It will be remembered that, at the Stirling meeting of the North British Association of Gas Managers, in July, 1887, Mr. J. Robb, of Haddington, suggested that the Association should endeavour to secure a "habitation," where they could form a library; and he offered to present several books if the scheme were gone into. The proposal was not proceeded with; and Mr. Robb has now taken the public-spirited step of presenting 50 volumes—being an entire set—of the JOURNAL OF GAS LIGHTING from its commencement, to the Edinburgh Public Library. Mr. Robb deserves the highest commendation for the disinterested step he has taken, particularly from young men engaged in the study of gas making, to whom the opportunity of consulting a set of the JOURNAL will prove a great boon.

The newspapers this week record the death, under melancholy circumstances, in London, of Mr. Hugh Graham, who was for 25 years a clerk in the consumers' department of the Edinburgh Gas Company. He retired from the Company's service immediately before the transfer; the Company giving him a pension of £50 a year. Only one payment of this annuity was made; the second being about due when he was suddenly cut off. Mr. Graham was careful and attentive to his duties, and was well liked by his fellow-clerks. He had gone to London on a visit; and on Tuesday was at Ascot, but was obliged to return to his hotel in the Strand. He was found on Wednesday afternoon in an insensible condition, and was taken to King's College Hospital, where he died on Thursday.

The accounts of the Dundee Water Commission for the past year have closed well. At a meeting on Thursday of the Finance Committee, Bailie Craig, the Convener, laid before the Committee his estimate of the income and expenditure for the current year, based upon the results of the year just closed; and his proposals were adopted. With an estimated expenditure of £42,810, they actually expended £42,000; and the revenue, estimated at £42,393, actually yielded £43,851—leaving a surplus on the year of £1851. This was realized with the domestic water-rate at 1s. 2d. per £1. It is proposed this year to reduce it to 1s. 1d.; at which rate, with the increase of assessable rental, which last year rose by £3000, it is estimated that the domestic rate will produce £16,900, as against £18,058 last year. The public rates and the special rates to traders will bring up the revenue, it is estimated, to £43,025; and the expenditure is fixed at £42,950, showing a surplus of £75. It is likely, if matters go on as favourably in the current year as they have for some time, that this estimate will be more than realized.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

The annual meeting of the North British Association of Gas Managers will open in Dunfermline on Thursday, July 25, with Mr. G. R. Hislop, of Paisley, as the President. In the addition to the address from the chair, there are likely to be some five or six papers submitted to the meeting. One of these, I believe, will be from Mr. Macpherson, of Kirkcaldy, who is expected to deal with regenerative gas firing in some way. Mr. M'Crae, of Dundee, has also consented to read a paper; and Mr. M'Gilchrist, of Dumbarton, is to relate some experience which he has received in reference to selling gas. Mr. Bell, of Peebles, and T. D. Hall, of Montrose, are also on the list for papers on interesting subjects. I understand that the annual excursion on this occasion has been fixed for Aberfoyle, in the Rob Roy country. Doubtless many of the members will be a little surprised at this choice, because there was an understanding that Dunfermline was selected as the place of meeting owing to the readiness with which an excursion might be had from there to the Forth Bridge, which is now rapidly nearing completion, and is one of the greatest engineering structures which the world has yet seen. All the same, the Dunfermline meeting is expected to be a great success.

The annual meetings of the Gas Companies throughout the West and South of Scotland are now in full swing. Beginning with those in southern towns, I would first notice that of the Kelso Gas Company which was held on Wednesday. In the report which was submitted by the Directors for the past year, it was shown that the loss of gas from leakage and condensation had been reduced to 4 per cent., which is certainly well nigh the smallest loss in connection with any gas-works north of the Tweed. The statement of accounts was submitted and approved; and the usual dividend of 10 per cent. was declared. The Jedburgh Gas Company's annual meeting was also held on Wednesday, at which it was resolved to declare a dividend of 7½ per cent., and to carry the sum of £100 to depreciation account. Yesterday the shareholders of the Langholm Gas Company held their annual meeting, at which it was resolved to declare a dividend of 6 per cent.

The Stewarton Gas Company's annual meeting was held on Monday, when a dividend of 12s. 6d. per share, and a reduction in the price of gas of 5d. per 1000 cubic feet, with the usual discount to large consumers, were unanimously agreed to. This makes the price of gas at Stewarton (which is near Kilmarnock) 4s. 2d. per 1000 cubic feet, as against 4s. 7d. for the past three years. It seems that this liberal action on the part of the Directors of the Company is being much appreciated by the consumers, amongst whom, however, there is a feeling that the number of shareholders might with advantage be increased—in other words, they are opposed to the tendency towards exclusive purchasing of the shares by the Directors and their immediate friends. The Directors of the Bellshill (Lanarkshire) Gas Company have agreed to recommend to the annual meeting of the shareholders that the price of gas be reduced from 4s. 7d. (at which it has remained for the past two years) to 4s. 2d. per 1000 cubic feet. The shareholders of the Bo'ness Gas Company held their annual meeting on Monday. It transpired in the course of the proceedings that the undertaking was in a fairly prosperous condition. Nearly eleven million cubic feet of gas had been made during the year; being nearly a million cubic feet over the make of the previous year; and to meet the still increasing demand, contracts had been entered into for the erection of three additional condensers, and a scrubber-washer, at a cost of between £300 and £400. It was stated that the leakage of gas had been brought down to 13 per cent., as compared with 15·42 per cent. in the preceding year. A dividend of 10s. per £6 share was declared; and it was agreed to reduce the price of gas to 3s. 11½d. per 1000 feet after the next meter survey. The price was 6s. 8d. in 1875; and since then it has been reduced six times. During the past three years the price has been 4s. 2d. per 1000 cubic feet.

During the past week considerable prominence has been given in the local papers to the extensions now in progress at the Paisley Gas-Works.

Most of the facts, if indeed not the whole of them, have already been given in the JOURNAL. It may be stated, however, that the contract for the iron roofing over the new retort-house has been let to Messrs. Hanna, Donald, and Wilson, of Paisley. It will be some time yet before the contract for the new holder is let, the construction of which will probably be completed by the month of August next year.

It is stated in one of the local papers of to-day that there is a probability of a Company applying to the Board of Trade for powers to supply the town of Paisley with electric light. The writer says: "One cannot help, in face of this sign of the times, feeling somewhat timid in regard to the fortune of the Corporation gas supply, in which a very large amount of capital is invested, and in which a great many more thousands are about to be invested by the erection of a new gasholder. No doubt," continues the writer, "both gas and electric light will be needed. But evidently the originators of the Company referred to believe themselves able to supply light more economically or better in quality than the gas now being burned here; else they would not seriously propose to enter into competition with the present supply of gas."

The preference stock of the Partick, Hillhead, and Maryhill Gas Company changed hands on the Glasgow Stock Exchange on Thursday at £5 3s. 9d. per share; the previous price having been £5 5s. Yesterday business was done at £5 2s. 6d.

The Glasgow pig-iron market has been much stronger this week; Scotch warrants advancing in price from 42s. 11½d. per ton cash on Monday, to 43s. 8½d. yesterday—the close in the afternoon, however, being just a shade easier. Cleveland and Cumberland hematite warrants have also fluctuated in price, and have made marked advances during the week. There is rather more demand for the Scotch special brands of pig-iron, the prices of some of which have advanced 6d. to 1s. 6d. per ton. The greater strength in the market this week is said to have been principally due to continued reports of better trade in America, as also to the rather better demand from Canada.

In the local coal trade, there is a considerable amount of business doing; but it has been very much interfered with by the strike of the seamen and harbour labourers, which is now, however, practically at an end. Prices have generally remained firm.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 29.

Sulphate of Ammonia.—There is but little life in the market. There is no change in the quotations; there being just sufficient demand to counteract a decline in values, but business generally is unusually slack. It may be that the low nitrate prices cause consumers of sulphate to hold their hand, after having secured a portion of their requirements; but if such be the case, the firmer tone in nitrate to-day ought to bring us more sulphate orders. Stocks are small; and the production is now almost at its minimum—facts which seem to preclude a decline for the present. Transactions have taken place at Hull and Liverpool at £11 17s. 6d.; and at Leith at £11 16s. 3d. Nitrate is now quoted at 8s. 6d. on spot. The consumption to the end of June shows a slight increase on the figures of last year.

LONDON, *June* 29.

Tar Products.—Excepting carbolic acid, all products are being offered without finding buyers. The market has not been so flat as it is at present for two years. Whether there is a conspiracy to depress products, or that the quantity made is in excess of the requirements, it is difficult to say. But if the present depressed condition continues, people who recently paid high prices for tar will have cause to rue their bargains. Quoted prices are: Tar, 23s. to 28s. per ton, according to position. Benzol, 90 per cent., 2s. 8d. per gallon; 50 per cent., 2s. per gallon. Toluol, 1s. 4d. per gallon. Solvent naphtha, 1s. 2½d. per gallon. Crude naphtha (30 per cent.), 11½d. per gallon. Light oil, 3½d. per gallon. Creosote, 2½d. per gallon. Pitch, 21s. to 23s. per ton. Carbolic acid (60's), 3s. 9d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. to £1 per ton. Anthracene (30 per cent.), "A" quality, 1s. per unit; "B," quality, 10½d. per unit.

Ammonia Products.—Sulphate is exceedingly dull; so much so, that were it not that makers are fairly free from stock, and the make is at the moment small, they would have to cast about for other outlets than those which are usually open at this time of the year. Very little business is reported; and prices quoted vary from £11 12s. 6d. to £11 16s. 3d., according to position. Prices of other products are: Gas liquor (5° Twaddel), 7s. 9d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¼d. per lb. Carbonate of ammonia, 3d. to 3½d. per lb. Muriate of ammonia, brown, £18 10s. per ton; white, £23. Sal-ammoniac, £30 to £32 per ton.

REIGATE WATER COMPANY.—At the ordinary general meeting of this Company which was held at Reigate on the 6th ult., under the presidency of Mr. Alderman Budgen, the Directors reported a balance of £1396 to the credit of the profit and loss account, out of which they recommended the payment of a dividend of 7½ per cent., leaving £271 to be carried forward. This was unanimously agreed to.

TRIAL OF THE DINSMORE PROCESS AT SALFORD.—At the meeting of the Salford Town Council to-morrow, the following resolution of the General Gas Committee will be considered:—"That, subject to the approval of the Council, the offer of the Dinsmore Gas Company, Limited, of the right to use their patent process for the manufacture of gas at the Salford Gas-Works for a payment of £8250 be accepted, subject to the proviso that the Corporation may extend the period of option of purchase at the price named for a further term not exceeding twelve months beyond the six months originally proposed, on the payment for such twelve months, or any part thereof, of ¼d. per 1000 cubic feet for all gas made in that period under the Dinsmore process, and subject also to terms and conditions to be embodied in a contract to be prepared by the Town Clerk."

YORK GAS-WORKS GARDEN SHOW.—On Thursday, the 27th ult., a distribution of prizes in connection with the York Gas-Works Garden Show—a Society composed of men employed at the Company's works, who cultivate in their leisure hours small plots of ground belonging to the Company—was held on the ground adjoining the works. There was a good attendance. The Engineer and Secretary (Mr. C. Sellers) opened the proceedings by announcing the decision of the judges on the productions of vegetables and flowers by the 14 competitors; and then distributed small money prizes, given by Mrs. Sellers, his mother, to the six most meritorious displays. In doing so, he congratulated the men on the success of the first year's work of their little Society; and, in a characteristic speech, dwelt on the many advantages to be derived from occupying their leisure time in the pursuit of gardening. Votes of thanks were accorded to Mrs. Sellers for offering the prizes, and to the judges (Messrs. Stephenson and Hardcastle) for their care in deciding on the merits of the plots.

SUFFOCATION BY GAS.—A few days ago, six persons who had been sleeping in one room in a low lodging-house in Patterson, New Jersey, were found to be dead. Investigation showed that in each case death was due to asphyxia caused by an escape of gas.

EXHIBITION OF GAS APPLIANCES AT LEAMINGTON.—Last Tuesday there was opened at the Assembly Rooms, Leamington, an interesting exhibition of gas appliances organized by the Leamington and District Gas-Fittings Company. A number of well-known makers of gas appliances and apparatus had stalls; and the exhibition, which remained open until last Friday evening, was of a comprehensive character. The exhibits included an "Otto" gas-engine of the latest construction, various types of gas-meters and burners, and patent lamps; the Wenham type, many of which are already in use in the town, being largely shown. Messrs. H. and C. Davis's and Messrs. Wilson's gas cooking and heating stoves and appliances, as well as their very artistic gas-fires for drawing-rooms, attracted considerable attention. In connection with the exhibition, Mrs. Thwaites, of Liverpool, gave practical lessons on cooking.

THE BRADFORD WATER-WORKS SCHEMES.—A special meeting of the Water Committee of the Bradford Town Council was held last Friday for the purpose of opening and considering the report of Dr. C. Meymott Tidy on the Grimwith and Nidd Valley schemes for increasing the Bradford water supply. Alderman Robertshaw, Chairman of the Committee, presided. The report has not been published; but it is stated that Dr. Tidy decidedly condemns the Grimwith scheme. He points out that, owing to certain polluted and polluting streams, the Grimwith water is unfit for drinking purposes. He adds that the Grimwith Beck, at the other side, although of very good water, is of about 8° of hardness; and he leaves the Committee to judge, firstly, whether, excluding the streams referred to, there will be a sufficient supply of water; and, secondly, whether it is of such softness as to be good enough for the trade purposes of the town. Dr. Tidy further reports that of all the samples sent the Grimwith water is the most active upon lead. After a short discussion, it was unanimously resolved to refer the report to the Consulting Sub-Committee, with instructions to them to complete their report, and submit it to the Committee, in order that the whole may be printed.

THE RAILWAY AND CANAL TRAFFIC ACT.—Last Friday a conference of objectors to the provisions of this measure acting in concert with the Railway and Canal Traders' Association, and of members of the Association, was held at the Cannon Street Hotel, to consider the circulars issued by the Board of Trade to objectors, and to the railway companies. Mr. A. Lafone, M.P., presided; and among those present were representatives from corporations, chambers of commerce, and trading associations of Birmingham, Lancashire, Cheshire, Sheffield, Nottingham, Brighton, Newcastle, Dublin, Belfast, Glasgow, and other towns. The Chairman stated that between 3000 and 4000 objections had been lodged with the Board of Trade, who wanted the associations to do some of the preliminary work in negotiation with the railway companies. As yet, however, the traders had no settled policy. There were about 170 bodies of objectors already, and classification had therefore become necessary. Resolutions were passed to the effect that the classifications proposed by the railway companies were unsatisfactory, and appointing a representative Committee of objectors to negotiate with representatives of the companies. Similar resolutions were passed at a meeting of objectors held on the same day at the Westminster Palace Hotel.

THE SOUTH METROPOLITAN GAS COMPANY FINED FOR DEFICIENT ILLUMINATING POWER.—At the Woolwich Police Court last Saturday, the South Metropolitan Gas Company were summoned by the London County Council for supplying, on the 18th of December last, at the testing-house, 211, Burrage Road, Plumstead, gas of less illuminating power than required by Act of Parliament. Mr. Roberts, who prosecuted, said the Company were bound by Act of Parliament to provide gas of not less than 16-candle power; but on the day in question it was found at the testing-house in Plumstead to be of only 15·3 candle power. The penalty for the first half-candle deficiency was 40s.; and where it amounted to a candle deficiency, it was £25. There had been a previous conviction against the Company at that Court, when a nominal fine of 10s. was inflicted. Mr. Washington, for the Company, admitted the accuracy of these statements. He said the Company were naturally anxious, in the face of so much opposition, to keep up the proper illuminating power of the gas; but the fact was that the candle test was not very reliable, as the Company's own test on the same day gave 16·72 candles as the illuminating power of the gas. Mr. Marsham said, as the Company had been previously fined, he had no power to mitigate the penalty. He therefore inflicted a fine of 40s., and 2s. costs.

BURNLEY CORPORATION GAS AND WATER SUPPLY.—The annual report of the Burnley Corporation officials on the work done during the year ended the 25th of March last has just been issued. With regard to the Gas Department, Mr. John P. Leather, the Manager, states that the increase in the consumption of gas is below that of previous years; being only 3·83 per cent., as compared with 5·99 per cent. in the preceding twelve months. There are now 1387 public lamps; being 107 more than last year, and their consumption for the past twelve months has been 28,539,500 cubic feet. There have been 29,894 tons of coal and 2324½ tons of cannel used during the year, or a total of 32,218½ tons. The percentage of cannel is therefore 7·21. In the previous year 7·24 per cent. of cannel was used. The quantity of gas made per ton has been 10,011 cubic feet, against 9766 cubic feet per ton in 1887-8. The sum received for gas and meter rents amounted to £37,528 4s. 8d. As to the water undertaking, Mr. Williamson, the Manager, states that the consumption of water in the town averaged 1,570,527 gallons per day; being 252,216 gallons for trade purposes, and 1,374,904 gallons for domestic use. The expenditure on capital account was £19,954 16s. 4d., of which £19,378 was in connection with the construction of Cant Clough reservoir. The estimated expenditure during the current year is £23,100, of which £20,000 is put down for this reservoir. At a special meeting of the Town Council held last Thursday, estimates for the new rates were submitted. Mr. Thornber, Chairman of the Finance Committee, made a statement in which he said that in the Water Department they were better than the estimate by £875 18s. 6d., due to the increased amount of revenue. In respect to gas they were £2783 3s. 10d. better than the estimate—due mostly to the decreased cost of production, and the higher price for residuals. He added that they would require a considerable sum to complete the Cant Clough works and the extension of the gas-works. In these items they would have to spend more than £100,000 on capital account during the next few years. The Mayor (Alderman Greenwood) thought the Council had every reason to congratulate themselves in coming out so near to the estimates. He believed it was due partly to the very successful working of the Water and Gas Departments, particularly to the latter. In the year 1886 the profits from that department were £2867. During the past year they had risen to £7246, including £500 paid over to the reserve fund; and for the coming year, including £500 to be paid to the reserve fund, there would be an estimated profit of £7450, or, apart from the reserve fund, there would be handed over in relief of the rates £6950.

REDUCTION IN THE PRICE OF GAS AT SHREWSBURY.—The Directors of the Shrewsbury Gas Company have reduced the price of gas to 2s. 10d. per 1000 cubic feet (a reduction of 2d.) to consumers within the borough, as from the close of the June quarter. The price outside the borough remains as before—3s. per 1000 cubic feet.

THE WATER SUPPLY OF ROTHERHAM OUT-DISTRICTS.—The Rotherham Rural Sanitary Authority had before them yesterday week a scheme (which they have adopted) for supplying with water, at a cost of about £4500, the villages of Aston, Catcliffe, Orgreave and Treeton. It is proposed to construct a service reservoir, to erect a meter-house, and to lay the necessary pipes; the water to be taken from the Handsworth Local Board. The works are to be completed within six months.

NATIONAL PURE WATER ENGINEERING COMPANY.—On Saturday, the 22nd ult., an unopposed creditors' petition was presented against this Company. Some time ago a provisional liquidator was appointed by the Court. The petitioners claimed on dishonoured bills of exchange given them for works executed; and it appeared the Company had no means of paying. Debenture-holders to the amount of £7600 appeared and supported the petition; and the usual winding-up order was made.

EXTENSIONS AT THE MORECAMBE GAS-WORKS.—The consumption of gas at Morecambe being still on the increase, it has been found necessary to carry out some alterations at the gas-works; and, in addition to putting in a new meter and governor, it has been decided to abandon the jet exhauster now in use, which will be replaced by a duplicate set of R. and J. Dempster's exhausters. The whole of the alterations are being carried out under the direction of Mr. W. Duff, the Company's Engineer.

THE WATER SUPPLY OF LURGAN.—At present many complaints are being made by inhabitants of Lurgan in regard to the marked scarcity of water suitable for domestic purposes, which is experienced in several districts of the town. The water supply of Lurgan, with its population of close on 15,000, and its many important industries to the carrying on of which an ample supply of water is essential, is provided simply by a number of "public pumps" situate in different districts of the town; and some of these pumps, it is alleged, are now quite dry. For a long time past the question of obtaining a proper water supply for Lurgan has engaged the attention of the Town Commissioners; and at present a movement is on foot by the Commissioners of Lurgan and Portadown to join together in obtaining a supply from the Bann Reservoir Company, whose reservoirs are stationed at Loughislandreavy.

THE HEYWOOD CORPORATION AND THEIR GAS MANAGER.—It is reported that Mr. Henry Hawkins has decided to resign the position of Manager of the Heywood Corporation Gas-Works. As stated last week, Mr. Hawkins wished to be allowed to remove his residence from the gas-works, where, according to his contract, he is bound to reside, in order to carry on a medical practice in another part of the town. A special meeting of the Gas Committee, which all the members were invited to attend, was held to consider the matter last week. A majority of those present were adverse to the proposal made by Mr. Hawkins; hence his resignation. Mr. Hawkins offered to continue the management of the works at a commission of 10 per cent. on the profit, notwithstanding that this has been very largely anticipated by a reduction in the price of gas made recently. Some of the Committee were in favour of offering him a commission of 7½ per cent.; but the question of residence seems to have been considered one of great importance.

THE DRAINAGE SCHEME FOR MARGATE.—Mr. Arnold Taylor, one of the Local Government Board Inspectors, has concluded the further stage of the drainage inquiry at the Town Hall, Margate; and the matter now awaits the decision of the department. It may be remembered that the scheme recommended by Mr. Baldwin Latham, C.E., proposed to convey the drainage of the town in a deep tunnel through the chalk cliffs to Foreness Point, where strong tides exist, which, it is hoped, will carry the refuse matter out to sea. The Corporation and the ratepayers, however, are sharply divided in opinion as to the merits of the scheme; and at the previous inquiry, held three months ago, counsel attended and engineering witnesses of the highest repute in sanitary matters were examined on either side. The recent inquiry had for its object to hear the views of the landowners beyond the borough, through whose lands the sewer is intended to pass continuously for upwards of a mile. They all objected to the interference caused by the works and to the foul smells which must arise from this long subterranean chamber or gallery during periods variously estimated at three to eight hours, and occurring twice in each 24 hours, when the sewage would be locked up awaiting its discharge into the sea, according to the varying conditions of winds and tides. Mr. Bidder, Q.C., for the promoters, recalled Sir F. Bramwell, Mr. G. Chatterton, C.E., and Mr. Baldwin Latham, C.E., to express their unabated confidence in the scheme. The Inspector announced that he would view the proposed outfall and line of the work before making his report.

THE BECKTON STOKERS AND THEIR GRIEVANCES.—On Sunday morning, the 23rd ult., large meetings of gas stokers were held at East Ham and at the Railway Arches, St. Pancras, to protest against some of the evidence given at the Westminster County Court on the previous Wednesday in the proceedings (reported last week) taken against The Gaslight and Coke Company for the alleged wrongful dismissal of a stoker, and also against the Judge's decision. The meeting at East Ham was presided over by Mr. Walsh; that at St. Pancras by Mr. Hutchings. The former, in the course of his opening speech, expressed regret at being compelled to say they had nothing to fear from the Managers or Directors of the Company, but from the men who worked side by side with them, and from those who were raised a step above their fellows to a post of desperate authority. The staple cause of Manley "getting the sack" was that he was an agitator. Their Union had been formed for the purpose of protecting themselves from the tyrannical, coercive, and terrible methods of exacting all the work out of them that it was possible to get. He then commented in strong language upon the evidence given by several of the witnesses, as did also Mr. Thorne, who followed him. Mr. Ward moved—"That in the opinion of this meeting of gas workers, two scoops and seven shovels is as much as any gang of men can put into a retort, and hopes the Engineer will not ask the stokers to put in more." This was carried unanimously. Mr. Manley, the plaintiff in the test case, was present, and thanked his friends for the kind way in which they had assisted him. At St. Pancras, Mr. Thorne stated that although defeated in Court they were not disgraced, although the Company were. Now was the Company's turn; in two or three months it would be the stokers' turn. The previous Sunday's meeting at Brentford resulted in the men getting 6d. a day extra and a reduction of 10 retorts, not only at Brentford, but at Southall also. If they stuck together, they would get what they wanted; but if they became disorganized, they would get lashed worse than ever. The following resolution was passed:—"That this meeting registers its emphatic protest against the injustice of the dismissal of nine men from the carbonizing department at Beckton for taking part in the present agitation."

LIVERPOOL CORPORATION WATER SUPPLY.—It was reported at the meeting of the Liverpool Water Committee yesterday week that the revenue received up to date for the current financial year amounted to £74,643, as against £70,745 last year.

KIRKBY-IN-ASHFIELD WATER SUPPLY.—New water-works have been constructed for the supply of Kirkby-in-Ashfield and Skegby; and on Wednesday last they were formally put into operation by the Chairman (Mr. E. Bonser) and members of the Sutton-in-Ashfield Local Board. There were a large number of inhabitants present to witness the proceedings. The sum borrowed for the purpose of the extension was £6000; and the work has been carried out in a satisfactory manner by Messrs. Tomlinson and Son, of Derby.

AN ELECTRIC LIGHTING SCHEME FOR KINGSTON AND THE SURROUNDING DISTRICT.—At the last meeting of the Wimbledon Local Board, the members had under consideration a proposal by a Company (the name of which did not transpire) to supply electric lighting to a large district, embracing Wandsworth, Wimbledon, New Malden, Surbiton, Kingston, Ham, Richmond, Mortlake, Barnes, Kew, and Putney. The capital of the concern is £500,000 (nominal). Contracts will, after the Provisional Orders have been obtained, be entered into with responsible firms to lay underground mains throughout the district, capable of supplying 100,000 lamps from three centres at Kingston, Mortlake, and Wandsworth respectively, and to supply generating plant for 50,000 lamps at once. The contract price is to be £400,000. The contractors will also work the stations and supply the current required, not being less than 50,000 lamps, for £1 per lamp per annum. The projectors of the scheme submitted a very rosy computation of what they hope to achieve in a financial way. The revenue from 50,000 lamps—the minimum supply—is estimated, at 4½d. per unit (which is stated to be equivalent to gas at 3s. 6d. to 3s. 9d. per 1000 cubic feet), to produce rather more than £80,000 per annum; leaving a surplus of £30,000 per annum for the Company. After providing for the expenses of collection and a sinking fund, there will remain, even from the rental of 50,000 lamps, a surplus capable of paying a dividend of from 4½ to 5 per cent. These figures are based upon supplying a population of about 210,000. The Chairman of the Board (Mr. T. Townsend) remarked that it was one thing to show these figures on paper, and another to realize them after a few years' experience. The Company's communication was referred to the Electric Lighting Committee. It is stated that the Board are also applying for a Licence to enable them to light the district under their jurisdiction by means of electricity.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 12.)

Issue.	Share	When ex-Dividend.	Dividend & Price of Bonds.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Apr.	10½	Alliance & Dublin 10 p. c.	10	18—19	..	5 10 6
100,000	10	„	7½	Do. 7 p. c.	10	13—14	..	5 7 2
800,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	111—113	..	4 8 6
100,000	20	30 May	10	Bahia, Limited	20	23—25	..	8 0 0
200,000	5	15 May	7½	Bombay, Limited	5	7—7½	..	5 0 0
40,000	5	„	7½	Do. New	4	5—5½	..	6 9 1
880,000	Stck.	14 Feb.	11½	Brentford Consolidated	100	229—234	..	5 0 5
125,000	„	„	8½	Do. New	100	167—172	..	5 1 9
220,000	20	14 Mar.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	20	28 Mar.	11½	British	20	45—47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
89,000	10	„	8	Do. 7 p. c.	10	13½—14½	..	5 10 4
828,750	10	30 May	10	Buenos Ayres (New) Limited	10	14¼—15¼	−1	6 9 0
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	28 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	11 Apr.	13½	Commercial, Old Stock	100	265—270	+2	5 1 10
130,000	„	„	10½	Do. New do.	100	213—218	..	4 18 8
130,000	„	28 June	4½	Do. 4½ p. c. Deb. do.	100	122—125*	+½	3 12 0
557,320	20	14 June	13	Continental Union, Limited	20	46—48	..	5 8 4
242,680	20	„	13	Do. New '69 & '72	14	33¼—33½	..	5 8 5
200,000	20	„	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	204—208	..	4 16 2
234,060	10	30 Jan.	13	European, Limited	10	25½—26½	..	4 18 1
120,000	10	„	13	Do. New.	5	17½—18½	..	5 5 3
354,060	10	„	13	Do. do.	5	12½—13½	..	4 16 3
5,468,600	Stck.	14 Feb.	13	Gaslight & Coke, A, Ordinary	100	263—269	+1	4 19 8
100,000	„	„	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 8
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	257—262	..	3 16 4
30,000	„	„	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	183—187	..	4 0 4
1,300,000	„	„	7	Do. H, 7 p. c. max.	100	165—170	..	4 2 2
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	355—360	..	3 16 11
1,061,150	„	14 June	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 6 8
294,850	„	„	4½	Do. 4½ p. c. do.	100	125—128	..	3 10 3
650,000	„	„	6	Do. 6 p. c. do.	100	170—178	..	3 9 4
8,600,000	Stck.	15 May	10	Imperial Continental	100	205—209	..	4 15 8
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—115	..	4 6 11
541,920	20	14 June	6	Monte Video, Limited	20	19½—20½	..	5 17 1
150,000	5	30 May	10	Oriental, Limited	5	9½—9¾	..	5 2 7
60,000	5	28 Mar.	7	Ottoman, Limited	5	6½—6¾	..	5 3 8
166,870	10	16 Jan.	4	Pará, Limited	10	5½—6	..	6 13 4
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	103—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	93—100	..	6 0 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16—17	..	5 17 8
500,000	Stck.	28 Feb.	16½	South Metropolitan, A Stock	100	317—322	..	5 0 11
1,350,000	„	„	13½	Do. B do.	100	235—240	..	5 1 0
141,500	„	„	13½	Do. C do.	100	260—270	..	4 18 1
600,000	„	28 June	5	Do. 5 p. c. Deb. Stk.	100	136—139*	+½	3 11 11
60,000	5	28 Feb.	11½	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	284—289	..	3 10 6
1,730,560	Stck.	11 Apr.	7½	East London, Ordinary	100	206—210	..	3 11 5
544,440	„	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	127—130*	..	3 4 9
700,000	50	14 June	9	Grand Junction	50	120—124	..	3 12 7
708,000	Stck.	14 Feb.	10½	Kent	100	272—277	..	3 15 9
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	252—257*	+1½	3 10 0
406,200	100	„	7½	Do. 7½ p. c. max.	100	200—208*	+1½	3 13 10
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	119—122	−1	3 5 7
500,000	100	14 Feb.	12½	New River, New Shares	100	350—355	..	3 8 4
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	126—129	..	3 2 0
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	172-175*	+½	3 8 6
1,126,500	100	„	6	Do. 7½ p. c. do.	100	163-166*	..	3 12 3
155,066	Stck.	14 June	10	West Middlesex	100	261—265	..	3 15 6

*Ex div

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

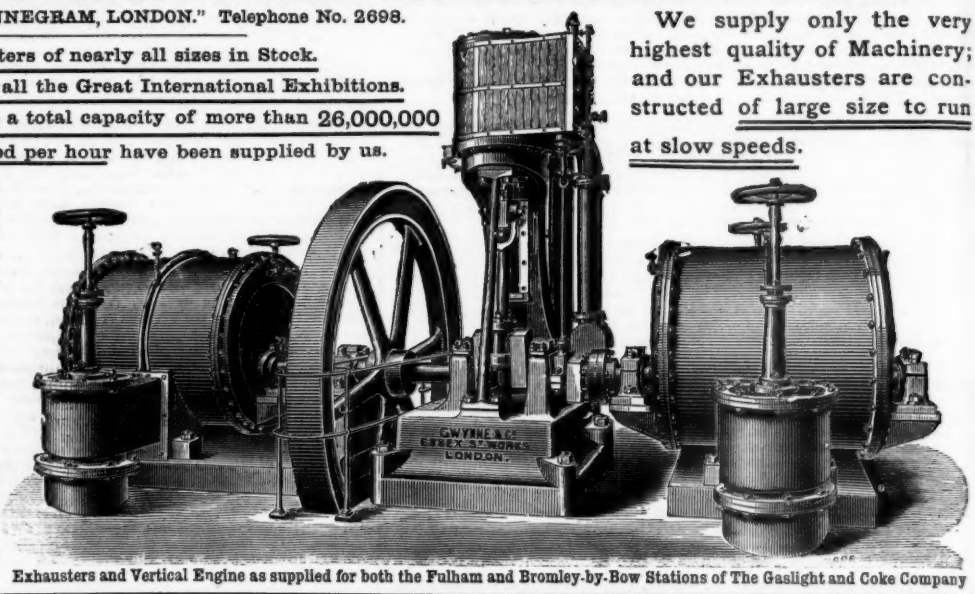
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND
No. 54, BERNARD STREET, LEITH,

SULPHATE of Ammonia Lead Work and Fittings. Lead Burner. Tanks and Saturators made and repaired on the shortest notice.

Address P. J. DAVIES, 78, Earl's Court Road, Kensington, LONDON.

ADVERTISER, nearly Eleven years Clerk to the late Mr. R. P. Spice, and also Secretary to a Company, is desirous of employment as CLERK, COLLECTOR, or SECRETARY'S ASSISTANT. Age 30. Married.

Address JOHN WATKINSON, 21, PARLIAMENT STREET, S.W.

TO CORPORATIONS AND LIMITED WATER COMPANIES.

THE Manager and Secretary of a Water-Works desires RE-ENGAGEMENT. Has life-long experience, and is thoroughly qualified to take full charge of any Water-Works, both indoor and out-door work; experience in both large Corporations and Limited Company. Prepared to give the highest references, both as to qualifications and character, and most satisfactory reasons for desiring re-engagement. Security to any amount.

Address No. 1716, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MANAGER wanted for a small Works. Make about 3 million cubic feet per annum. Must be a strong, steady, industrious Man, well acquainted with the duties. Wages 24s. per week, with House, Fire, Gas, &c.

Address, enclosing copies of testimonials, &c., to S. BARK, Gas-Works, GODALMING.

WANTED, a Gas-Meter Maker and Repairer; one who has been accustomed to both Wet and Dry Meters preferred. Wages, 35s. per week.

Applications to be sent, accompanied by not more than two testimonials, not later than the 12th of July, to J. TINDALL, Gas-Works, WALSALL.

STATION METER.

WANTED, a Station Meter, with 4-inch Connections, and in good going order.

Apply to JAMES CAMPBELL, Writer, SALTCOATS.

WANTED, small second-hand Gas-holder, capable of holding about 30,000 to 50,000 cubic feet of Gas.

Reply, with full particulars, to H., 55, Balfour Road, HIGHBURY.

TIMMIS & CO., of STOURBRIDGE Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

For Prices apply to JAMES LAWRIE AND CO, 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.

Telegraphic Address: "EIRWAL, LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gas-holders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 1192 of last week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.

Telegraphic Address: "Braddock, Oldham."

REDHILL GAS COMPANY.

WANTED, Two Second-hand Purifiers, 8 or 10 feet square.

Full particulars to the undersigned.

C. READ, Manager.

WANTED—Any Gas Company having for Sale one LIVESEY WASHER, and one KIRKHAM'S SCRUBBER for 500,000 feet per day, will please communicate with Mr. LONGWORTH, Gas Offices, GUILDFORD.

WANTED, Flanged or Spigot and Faucet GAS-PIPES, BENDS, TEES, and CROSSES; also three SLUICE-VALVES, all 15 inches to 18 inches diameter. New or second-hand.

Address No. 1720, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Business—Rare Chance—A well-fitted SHOP in a leading Thoroughfare, with fitted WORKSHOP, to be disposed of.

For particulars, in first part, apply by letter to DOOLEY, 154, Culford Road, LONDON, N.

FOR SALE—About 370 yards of 4-inch SPIGOT AND SOCKET GAS-PIPES (replaced by 6-inch), in good condition.

Apply to the GAS COMPANY, Broseley, SALOP.

FOR SALE—Four Purifiers, 16 ft. by 12 ft. by 8 ft. 9 in. deep inside, with 12-inch Centre-Valve (Walker's) and Connections. Practically equal to new. Would erect complete.

Also Four PURIFIERS 12 ft. by 6 ft. 9 in. by 8 ft. deep inside, with 10-inch Centre-Valve and Connections. Do.

Also One Cast-Iron SCRUBBER 40 ft. high by 10 ft. diameter.

Also One Cast-Iron SCRUBBER 24 ft. high by 10 ft. diameter.

Inquiries invited for various second-hand Gas Plant—Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.

Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.

120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys.*

Highest References and all particulars supplied on application.

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantities at highest market prices, or contracts for the year.

For price and terms apply Botolph House, Eastcheap LONDON, E.C.

FOR SALE—One of Anderson's Patent ENGINES and EXHAUSTERS combined, to pass 5000 cubic feet of Gas per hour. In thorough order. Can be seen at work at the Gas-Works, Chichester, Sussex. Coming down to be replaced by one of greater capacity.

For further particulars apply to R. S. CHURCH, Secretary, Gas-Works, CHICHESTER.

Gas and Water Shares in well-known and successful Undertakings, and offering highly desirable and sound Investments.

MR. ALFRED RICHARDS is favoured with instructions to SELL BY AUCTION, at the Angel Hotel, Edmonton (close to the Silver Street Station on the Great Eastern Railway), on Thursday, July 11, 1889, at Seven o'clock precisely in the Evening, in Lots, the following SHARES, viz.—

209 in the Tottenham and Edmonton Gas Company.
74 in the Mitcham and Wimbledon Gas Company.
76 in the Ottoman Gas Company.
86 in the Carshalton Gas Company.
100 in the Crystal Palace Gas Company.
30 in the Horley District Gas Company.
85 in the South-West Suburban Water Company.
50 in the Australasian Gas Association.

Particulars of the AUCTIONEER, TOTTENHAM, and 8, NEW BROAD STREET, E.C.

SPENT OXIDE.

OFFERS wanted for about 50 tons of SPENT OXIDE.

Sample and particulars on application to

C. B. TULLY,
Secretary and Engineer.

Gas-Works, Sligo, June 27, 1889.

TO SULPHURIC ACID MAKERS.

THE Gas-Works Committee of the Keighley Corporation invite TENDERS for the supply of about 200 tons B.O.V. during the next Twelve months.

Particulars may be obtained on application to the undersigned.

By order,
JOHN LAYCOCK, Engineer.

Gas Office, Keighley, June 25, 1889.

EVESHAM CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of 1000 to 1500 tons of GAS COAL, delivered free at Evesham Railway Station, during the Twelve months ending July 31, 1890, at such times and in such quantities as the Manager may direct.

Tenders, specifying the description of the Coal, to be sent to me on or before the 15th day of July next.

THOS. COX, Town Clerk.

Evesham, June 26, 1889.

PADIHAM AND HAPTON LOCAL BOARD.

THE Gas Committee of the above Board invite TENDERS for a Two years' supply of GAS COAL, to be delivered, as required, at the Padiham Railway Station.

For particulars apply to the undersigned.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Gas Coal," to be sent to me not later than Monday, the 15th inst.

By order,

J. H. SMITH, Clerk to the Board.

Local Board Offices, Padiham,
July 1, 1889.

DARWEN CORPORATION GAS-WORKS.

TO TAR DISTILLERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for all the surplus TAR produced at these Works for One, Two, or Three years. The Tar will be delivered into Contractor's Tanks on the Railway.

Forms of tender and any further particulars may be obtained from T. Duxbury, Engineer, Gas-Works, Darwen.

Tenders, endorsed "Tar," to be delivered to me not later than Twelve noon, Monday, July 22, 1889,

CHAS. COSTEKER, Town Clerk.

COCKERMOUTH LOCAL BOARD.

THE Gas Committee of the Cockermouth Local Board invite TENDERS for the supply and delivery at the Cockermouth Goods Station of about 1300 tons of GAS COAL, in such quantities as may be directed, during Twelve months ending July, 1890.

Parties tendering must specify the kind of Coals offered, the Pits from which they are raised, and supply an Analysis.

Tenders, endorsed "Gas Coal," to be delivered not later than the 6th of July next.

E. W. SMITH, Manager.

Gas-Works, Cockermouth, June 22, 1889.

TENDERS FOR GAS COAL.

THE Directors of the North Bierley Gas Company are prepared to receive TENDERS for 6500 tons of best screened GAS COAL, free from Dirt, Scale, and other objectionable matter; the whole to be delivered at Low Moor Station, Lancashire and Yorkshire Railway, and in such weekly quantities as will be decided by the Company's Manager.

Tenders to state the name of Seam from which the Coal will be got.

Sealed tenders, addressed to the Chairman, North Bierley Gas Company, Oakenshaw, near Bradford, to be delivered on or before Thursday, the 11th day of July, 1889.

The Directors reserve to themselves the right to divide the contract.

The lowest or any tender not necessarily accepted.

By order,

W. OLDFIELD, Manager.

GLASGOW CORPORATION GAS.

RESIDUAL PRODUCTS FOR SALE.

THE Glasgow Corporation Gas Commissioners are prepared to receive TENDERS for the purchase of the TAR and AMMONIACAL LIQUOR produced at the Dalmarnock Gas-Works from and after the 1st of September, 1889.

Forms of tender, on which offers must be made, and copies of the terms and conditions upon which the Products are to be sold, may be had on application to the Manager, at the Gas-Office, 42, Virginia Street, Glasgow; and offers, endorsed "Tender for Dalmarnock Residual Products," will be received by the Subscriber on or before Tuesday, the 9th prox.

The Commissioners do not bind themselves to accept the highest or any tender.

J. D. MARWICK, Town Clerk.

City Chambers, Glasgow,
June 12, 1889.

SMETHWICK LOCAL BOARD OF HEALTH.

GAS COAL.

THE Gas Committee are prepared to receive TENDERS for the supply of GAS COAL—viz., about 10,000 tons, for delivery during the Twelve months ending the 31st of December, 1890, and about 7000 tons for delivery during the Six months ending the 30th of June, 1891.

The Coal to be delivered in such quantities and at such times as may be required, carriage free, either at the Soho Station of the London and North-Western Railway, or the Handsworth Station of the Great Western Railway, as the Committee may determine.

Forms of tender and further information may be obtained from Mr. B. W. Smith, at the Gas-Works.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Coal," to be delivered to the undersigned not later than July 11.

The Committee do not bind themselves to accept the lowest or any tender.

By order,

WM. J. STURGES, Secretary.

Public Buildings, Smethwick,
June 29, 1889.

TAR AND AMMONIACAL LIQUOR.

TENDERS wanted, by the Llangollen Gas Company, Limited, for their produce of TAR and LIQUOR, for One year, to the 31st of May, 1890. About 400 tons of Coal carbonized. The Company will deliver at G. W. R. Station, Llangollen, into Buyer's Tanks and Trucks, or at the S. U. Canal Company's Wharf, Llangollen.

Address the GAS COMPANY, LLANGOLLEN.

GIBRALTAR GAS COMPANY.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Directors of the above Company invite TENDERS for One or Two years' supply of screened GAS COAL, yielding about 10,000 cubic feet of 16-candle Gas per ton.

The quantity required will be about 4000 tons each year.

Tenders to include Freight, Insurance, and all other Charges, and the Coal to be delivered, by Sailing Vessel (carrying from 200 to 500 tons), in Rosia Bay, Gibraltar, as required, commencing in August next.

Tenders, endorsed "Tender for Gas Coal," to be sent to the undersigned, so as to be received not later than July 20, 1889.

Copies of conditions, &c., will be forwarded on application.

BENJAMIN CARVER, Jun.,
Chairman of the Board of Directors.

Gibraltar, June 13, 1889.

CONTRACT FOR GAS COALS.

NOTICE is hereby given that the Local Board for the District of the Town of Horncastle, in the County of Lincoln, are prepared to receive TENDERS for the supply of from 500 to 1600 TONS of best screened SILKSTONE GAS NUTS, to be delivered by the 30th of June, 1890, in such quantities and at such times as the Board may direct. The Coal to be sent in a dry condition, free from Hards, Smudge, Dirt, Shale, Pyrites, or other impurities.

Sealed tenders, marked "Tender for Gas Coal," to be sent to the Chairman of the Board, Mr. John Panton, St. Lawrence Street, Horncastle, on or before the 9th day of July, 1889.

The Board do not bind themselves to accept the lowest or any tender.

By order,

CHARLES DEE, Clerk to the Board.

Horncastle, June 24, 1889.

CORPORATION OF LEICESTER.

(AYLESTONE ROAD WORKS.)

PURIFIERS.

SECTION No. 2. CONTRACT No. 15.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for th Manufacture, Delivery, and Erection complete of eight CAST-IRON PURIFIERS, 32 feet square, together with the necessary Wrought-Iron Covers, Valves, Connections, &c., at their Aylestone Road Works.

Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which amount will be returned upon the receipt of a *bonâ fide* tender.

Tenders, addressed to Mr. Councillor Lennard, Chairman, and endorsed "Tender for Purifiers," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, July 6 prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane,
Leicester, June 19, 1889.

COUNTY BOROUGH OF SALFORD.

THE Gas Committee propose to hold shortly an EXHIBITION OF GAS-FIRES, COOKING-STOVES, GAS-ENGINES, BURNERS, &c., in Peel Park, Salford.

Applications for space from persons desirous of exhibiting to be made to the Gas Engineer, Gas Offices, Bloom Street, Salford.

By order,

SAML. BROWN, Town Clerk.

Town Hall, Salford, June 22, 1889.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that the TRANSFER BOOKS of this Company, so far as they relate to the Company's Capital Stocks, WILL BE CLOSED on the Evening of Tuesday, the 9th day of July next, and be re-opened immediately after the Half-Yearly Meeting of the Company, to be held in the month of August next.

By order,

JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., June 29, 1889.

RIDSDALE RAILWAY LAMP AND LIGHTING COMPANY, LIMITED.

(IN LIQUIDATION.)

THIS is to give notice that, pursuan tto an order of Mr. Justice Stirling, made in the above Liquidation, and dated the 3rd day of June, 1889, the above-named Company has now no interest in my Gas Patents; and I am now open to negotiate for the sale of my said Patents, or for the manufacture and supply of my Patent Lamps.

Dated the 20th of June, 1889.

T. C. J. THOMAS.

Temporary Address:
Steavenson and Couldwell,
93 and 94, Gracechurch Street,
London, E.C.

Witness: E. CARTWRIGHT STEAVENSON,
93 and 94, Gracechurch Street,
London, Solicitor.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

JUST PUBLISHED.

EDITED BY CHARLES W. HASTINGS.

The Gas & Water Companies' Directory, 1889.

Demy 8vo, 270 pp., Cloth Boards, 5s., Post Free.

GAS-WORKS STATISTICS, 1889.

Demy 8vo, Stiff Covers, 104 pp., 3/6, Post Free.

WATER-WORKS STATISTICS, 1889.

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The above Three Works, Handsomely Bound in Cloth, in One Volume,

PRICE 10S. POST FREE.

These Books have been thoroughly revised to date, and contain much valuable and additional information. PROSPECTUS, giving SPECIMEN PAGES AND PRESS OPINIONS, post free on application to the Publishers,

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ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97 WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

JAMES NEWTON & SONS,

(Established 1820)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

TAR AND LIQUOR PURCHASED

JOHN CLARKSON MAJOR,

(Established 1851,)

Tar Distiller and Manufacturing Chemist,

WOLVERHAMPTON.

BRANCH WORKS:—

SCULCOATS, HULL.

ARMSTRONG'S

PATENT

CANDLE SAFETY LAMPS.

8, MANCHESTER STREET, GRAY'S INN ROAD, W.C

THE ONLY RELIABLE

DRY CENTRE-VALVE.

WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.

ALSO MADE FOR TWO OR THREE PURIFIERS.

No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.

Write for Prospectus.

ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.

F. WECK, 86, NEW STREET, BIRMINGHAM.

IMPROVED RETORT SETTING.

W. G. WALLER & Co.,

RETORT SETTERS & CONTRACTORS,

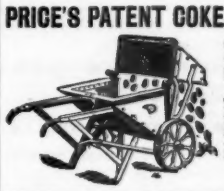
Having had much experience in the Setting of Retorts, beg to call the attention of Gas Engineers and Managers to their Improved System of Setting Retorts and Tar-Furnaces.

Contractors for Building Shafts, Tanks, Retort Benches, and all other Buildings connected with Gas-Works.

Estimates on application.

The Poplars, Waddon, Croydon, Surrey.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

SILICA

OR

GANISTER BRICKS

OF VARIOUS SIZES,

GROUND GANISTER, FIRE-BRICKS, &c.

SUPPLIED FROM

PEASE'S WEST WORKS, CROOK, BY

PEASE & PARTNERS, Limited,

DARLINGTON.

CAST-IRON PIPES

FOR GAS AND WATER.

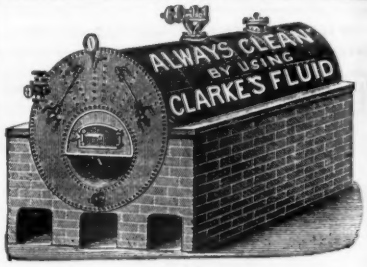
VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

56, ROBERTSON STREET, GLASGOW.



A 10-H.P. BOILER

KEPT PERFECTLY CLEAN FOR

ONE SHILLING PER WEEK

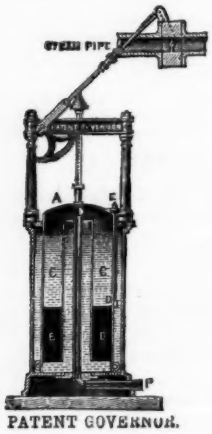
And much smaller Coal Bills. Softens the Hardest Water, and keeps Gauge-Glasses quite clear.

H. CLARKE & Co., Ld., Ipswich.

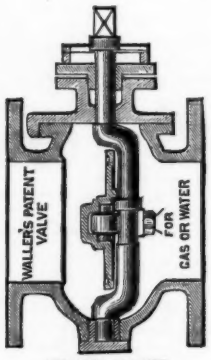
GEORGE WALLER & Co.'s NEW PATENT EXHAUSTER.

MADE WITH 4, 3, OR 2 BLADES.

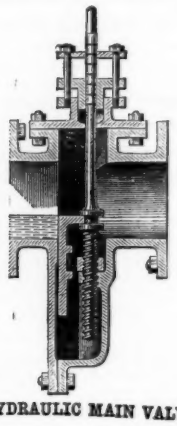
Also BEALE'S EXHAUSTERS.



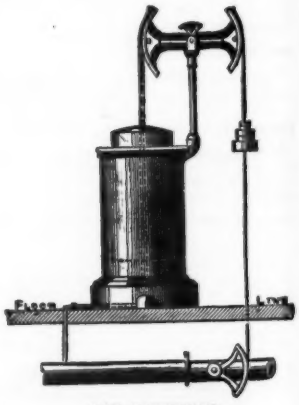
PATENT GOVERNOR.



CRANK VALVE.

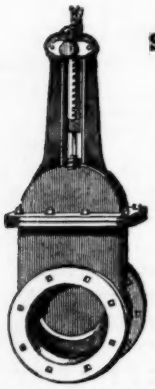


HYDRAULIC MAIN VALVE.

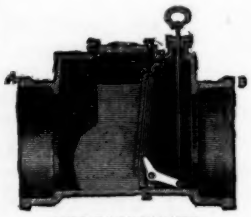


GAS GOVERNOR.

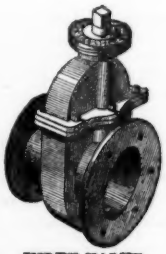
SCRUBBERS, PURIFIERS, CONDENSERS, COKE-BREAKERS.



OUTSIDE RACK VALVE.

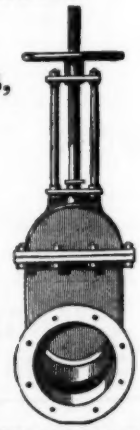


BYE-PASS VALVE.



INDEX VALVE.

DISC VALVE.



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SEE PREVIOUS ADVERTISEMENTS. ILLUSTRATED CATALOGUE ON APPLICATION.

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POPE & PEARSON, LTD.,
have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke.

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Manufacture and keep in Stock at their Works (also large stock in London)
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LANEMARK CANNEL.
Yield of Gas per ton . . 10,880 cub. ft.
Illuminating Power . . 29·21 candles.
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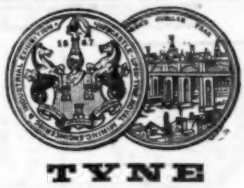

TYNE BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

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Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

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Thousands in constant work, give universal satisfaction.

Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

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This Coal yields 12,600 feet of 19-candle gas per ton.

Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

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FOR ANY PURPOSE.

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THREE MEDALS AND HONOURABLE MENTION

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TRADE MARK.
BELL'S ASBESTOS.

IS MADE READY FOR USE.

IS FIRE RESISTING.
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IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

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For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING 50 PER CENT. OVER THAT OF LEAD PAINTS.

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SQUARE. Every 10 feet has Label as above, and bears our Trade Mark.

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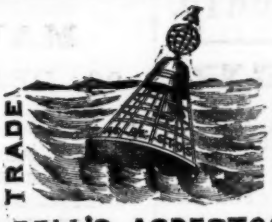

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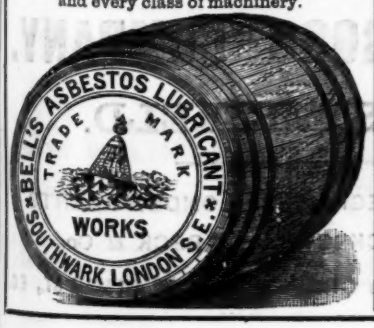
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



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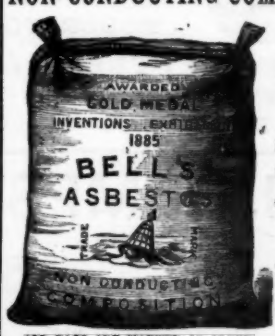

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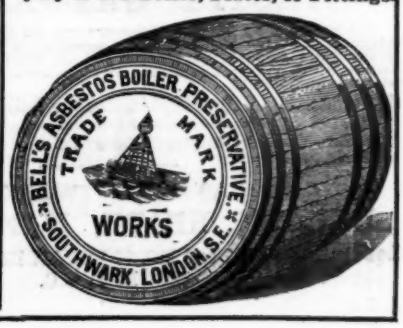

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RIVALS THE ELECTRIC LIGHT.
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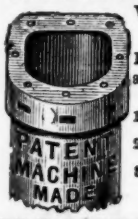

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Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

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PATENT
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CHANDELIERS IN BRONZE AND ORMOLU.
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MANUFACTORY AND SHOW-ROOMS:
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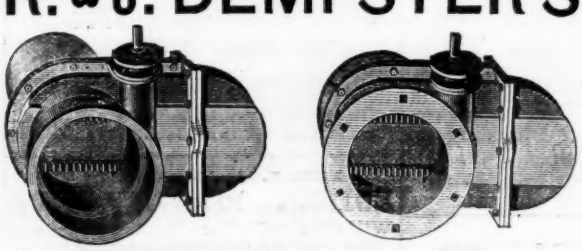

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A STOCK OF DIFFERENT SHAPES ON HAND.

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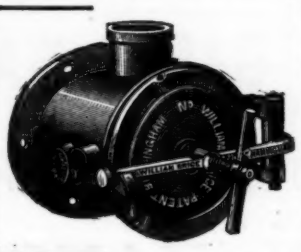

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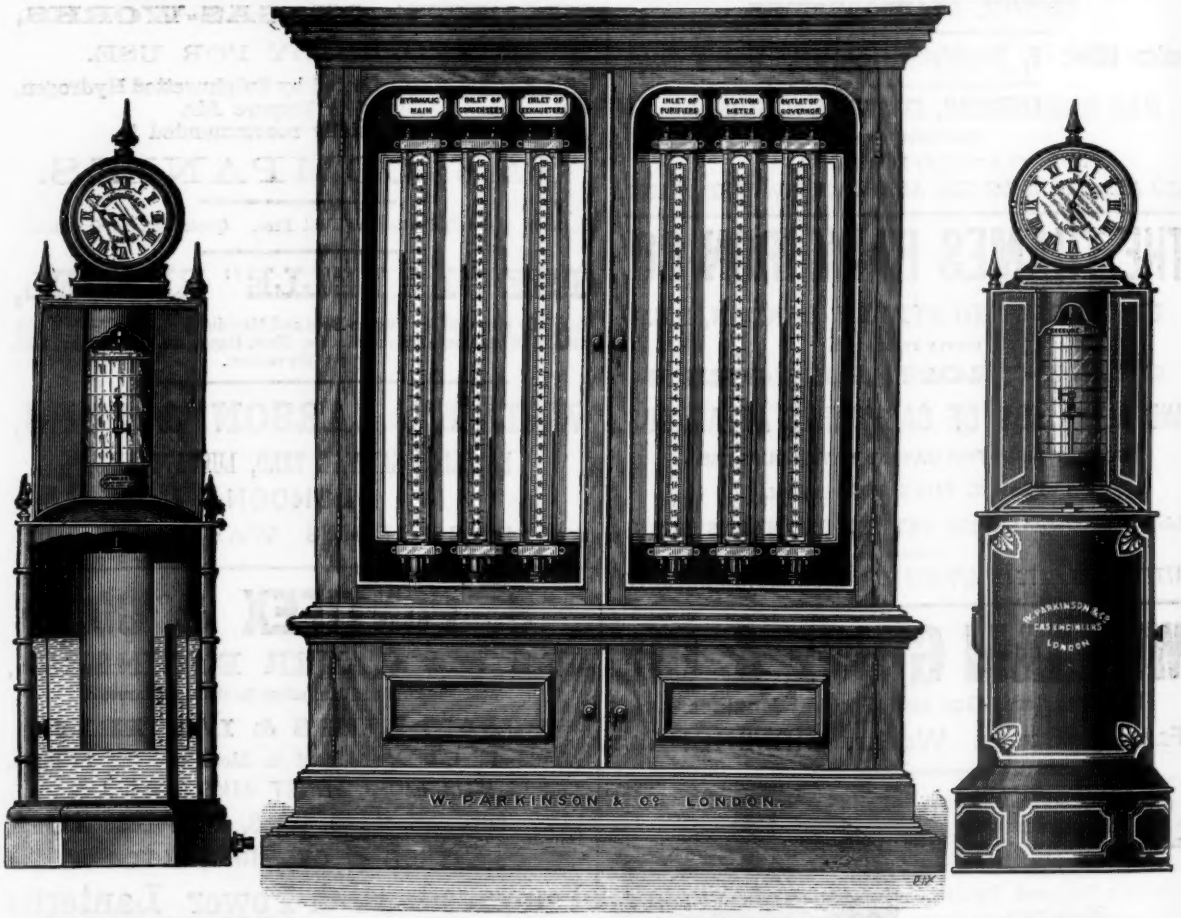

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[See also Advt., p. 8.

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THE GAS INSTITUTE.

PROCEEDINGS AT THE TWENTY-SIXTH ANNUAL GENERAL MEETING,

HELD ON

TUESDAY, WEDNESDAY, and THURSDAY, the 18th, 19th, and 20th of JUNE, 1889,

AT THE

INSTITUTION OF CIVIL ENGINEERS, 25, GREAT GEORGE STREET, WESTMINSTER.

PAPERS AND DISCUSSIONS.

EXPERIENCE IN THE MANUFACTURE OF OXYGEN ON GAS-WORKS, AND THE RESULT OF ITS PRACTICAL APPLICATION TO THE PURIFICATION OF COAL GAS.

By W. A. Valon, of Ramsgate.

At the meeting of this Institute last June, the author related an account of experiments in purification of gas from sulphur by the aid of oxygen. It is now desired to recount the development of those experiments in actual practice. It is proposed therefore to give:

(1.) An historical summary of the progress made to June, 1888.
(2.) A summary of the development of this progress in its application to every-day requirements.
(3.) The result of the application in actual practice.
(4.) The advantage accruing from the use of oxygen in the purification of coal gas, from a commercial, practical, and scientific standpoint.

In June, 1888, practical experiments at Westgate-on-Sea had reached a point which affirmed the value of oxygen as an agent for the purification of gas, and demonstrated that if pure oxygen could be brought economically within the gas maker's domain, it could not safely be neglected, and that it was of especial benefit as a purifying agent to those bound by legislation to keep within certain limits of purity as regards sulphur contamination. It will be remembered that attention was in the first instance directed to oxygen mixed in certain proportions with the gas and then passed into oxide of iron boxes; no doubt being felt that the life of purifiers so treated, and the advantage gained in luminosity, would allow a large margin to compensate for the outlay for the comparatively small quantity of oxygen required for complete revivification *in situ*. No disappointment has been experienced in this anticipation, for it has now been proved beyond doubt that where oxide alone is used, economy demands the use of cheap oxygen for revivification. Lime was the next material that received attention in order of investigation; and here was found a still more important application of oxygen than could be claimed in purification by oxide alone. The use of oxygen with lime disclosed perfect and complete purification in closed vessels. These practical experiments proved that when oxygen was mixed with gas, and passed through lime sufficient in quantity to remove the carbonic acid (CO_2) this was also sufficient to completely purify the gas from sulphuretted hydrogen (H_2S), and also sulphur compounds (CS_3); the latter being abstracted with absolute certainty, without anxiety and with great simplicity, together with the not least important result that the lime when exposed was perfectly innoxious, giving off no unpleasant odour.

During the discussion last year, it was suggested that these extraordinary results were perhaps due to area. It was therefore determined that investigation should be closely pursued in this direction, that reliable information might be furnished on this point. To do this it was first necessary to decide upon a means whereby oxygen might be manufactured on a cheap and practical scale for everyday requirements on a gas-works. Hitherto our experiments had been carried out with oxygen compressed in cylinders, an expensive and prohibitory form when applied to everyday purification. This therefore brings me to the second division of my remarks—a summary of the development of the progress made in our experiments in its application to everyday requirements.

In the description given last year of the mode of abstracting oxygen from the air by Brins process, it will be remembered that a varying temperature was relied upon. In the latter part of the year, however, after many careful experiments, it was determined that oxygen could be made more cheaply with the steel retorts maintained at a constant temperature than by the method heretofore adopted of one alternating between 1200° and 1450° Fahr. On this quickly followed the determination to insert the steel retorts containing the barium in ordinary gas-retorts, so as to heat them through the walls of those retorts. The method adopted is shown on diagram No. 1; diagram No. 4 being also a plan of the general arrangement. The mouthpieces and ascension-pipes were removed, fire-brick rests placed at intervals along the retorts (the steel tubes resting on these) and the entrance to the retorts covered by a cast-iron plate, the outside of which was coated with non-conducting material; four of the 22-inch by 16-inch retorts being equal to a production of more than 2000 cubic feet, which was in excess of the oxygen necessary for purification. The two bottom retorts were left empty and bricked up in front as shown. The heat was supplied by the furnace that ordinarily supplies heat to the retorts when distilling coals; and finding the desired temperature could be easily maintained in the steel tubes, no doubt remained of the practicability of the plan adopted. The tubes were therefore connected up to the pipes conducting the air to them and the oxygen from them. It will be observed on looking at the diagram, that the arrangement is a very simple one. Diagram No. 1 represents an elevation of a bed of retorts with the mouthpieces and ascension-pipes removed. A marks the clay retorts; B, the steel tubes; C, the small connecting-pipes attached to the air-tight covers; D, the main pipes connecting air-pump and small pipes or inlets of steel tubes; and E, the main pipe connecting air-pump and outlets of steel tubes. This arrangement as far as the manufacture of oxygen is concerned, is perfect, and only needs modification in the direction of securing greater economy in the cost of fuel—that is to say, if the steel tubes instead of being muffled were set open and exposed to the direct action of heat from the radiation of the flame, greater economy would result, and a larger number could be set in the one arch. The author has therefore in contemplation as a permanency, the arrangement shown on diagram No. 2, which in all essential conditions excepting the one referred to will be the same as No. 1. Where room is an object, and space cannot be well spared in the retort house, special producers of the upright type have been designed and are in use at Westminster. These take up but little room, and are very economical in fuel—indeed, unless it be decided on the question of first outlay, in all cases they should have the preference.

It has already been mentioned that the valves are reversed and the tubes worked at a vacuum in order to draw off the oxygen. To do this at present hand labour is necessary; but an ingenious arrangement for reversing has been devised by Mr. Murray, of Brin's Oxygen Company, which will dispense with the necessity of hand labour and make the reversal an automatic certainty. This arrangement, in the author's opinion, will

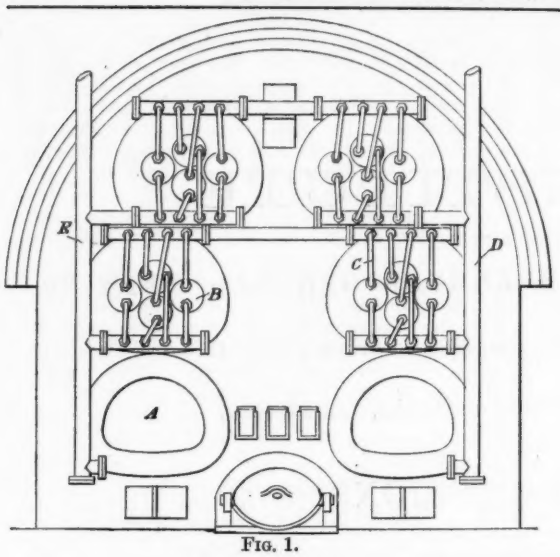

FIG. 1.

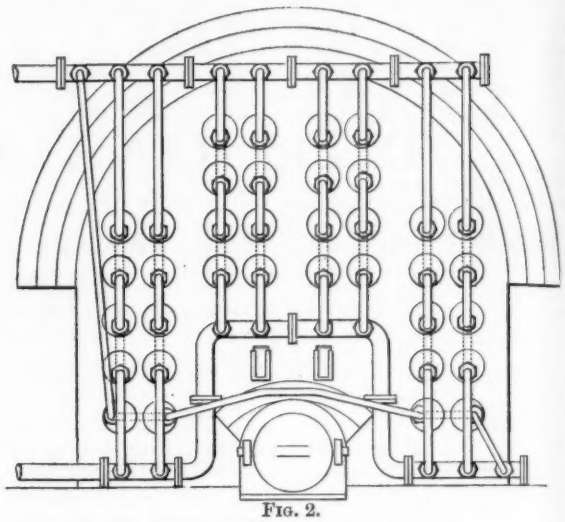

FIG. 2.

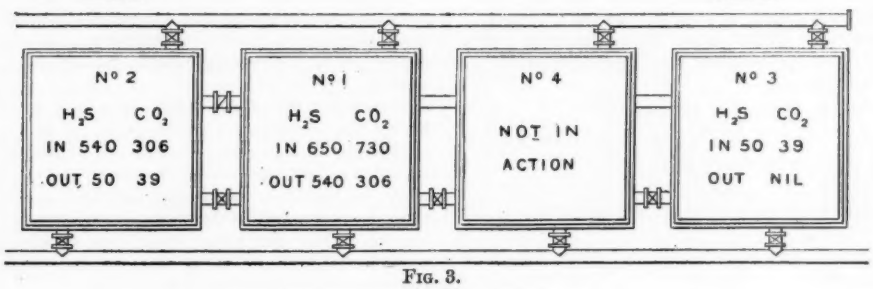

FIG. 3.

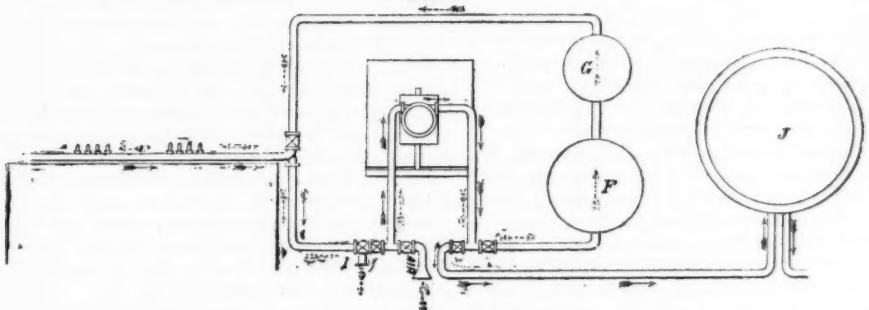

FIG. 4.

give the last touch of simplicity to the making of oxygen, which may be described as practically automatic.

Hitherto my remarks have been confined to an installation where one pump will be sufficient power for pumping and exhausting. An installation on a larger scale, however, requiring two or more pumps, can be arranged to work one-half, or one-third, or any desired number of tubes, so that one pump may be constantly pumping in, and the other constantly pumping out, and so save time—with, of course, the usual result that the larger the make, the cheaper the production. It should be mentioned that between the air-pump and the tubes are placed a small circular dry-lime purifier F, and also a small circular caustic soda purifier G. When the pump is set in motion, the air is taken from the atmosphere and forced direct through these purifiers into the steel retorts containing the barium for the space of a certain time; the nitrogen escaping by means of a relief-valve marked I. The valves are reversed, and the air that has accumulated in the pipes allowed to escape at a cock left open for the purpose, until a vacumn of 25 inches is shown on the gauge. The cock is then closed and the oxygen sent forward to the holder J. The holder in this instance has a capacity of only 40 cubic feet; but a larger one is desirable. The holder is connected to a meter regulated to pass the desired percentage to the inlet pipe of the exhauster; the oxygen from this point passing on with the crude gas to the purifiers. In this connection I may mention a proportional meter that has been designed by Mr. W. G. Hicks, of Ramsgate, which automatically regulates accurately the percentage of oxygen necessary for purification. This is accomplished by means of a spindle worked by geared wheels attached to the drum-shaft of the station meter. The percentage is regulated by the size of the wheel actuating the proportional meter. These wheels are interchangeable; therefore the percentage may be increased or decreased at will, and the proper quantity of oxygen for purification is thus passed into the gas in accordance with the quantity that is passing into the meter at that precise moment.

On the occasion of the visit of the Southern District Association of Gas Engineers to Ramsgate, on May 9,* which has already been reported in the public journals, mention was made of the purifying material when in a half-used state. When the lids were raised from the purifiers to allow of an inspection of the lime from which the gas had the moment before been shut off in the presence of those assembled, nothing offensive was discernable; but such an experiment tried during the progress of ordinary purifying operations would have been impossible without impregnating the whole neighbourhood with offensive odour. To make the trial as searching as possible, men were immediately employed to throw the lime on each side, until the bottom of the purifier was exposed to view. Some of the members then descended into the mass without inconvenience or discovering anything unpleasant. The purifier was then left uncovered until next morning, when the lime was again inspected by several gentlemen who had stayed behind, among others by Mr. J. W. Helps, Engineer to the Croydon Gas-Works; and in their presence it was re-adjusted on the grids, the lid lowered, and the purifier again brought into use. The lime remained active, doing work in purification, for another twenty-five days before it was finally thrown out of use,

* See JOURNAL for May 14, pp. 897 and 901.

and even then was not wholly spent, although it had passed seven million cubic feet after it was first inspected. This purifier was finally opened in the presence of Mr. Henry Hack, of Birmingham, who was at Ramsgate on June 3rd and 4th making a critical examination of the whole process; and the tests taken by this gentleman showed that at the time the purifier was shut off there was 630 grains of H_2S and 746 grains of CO_2 in the crude gas. The outlet of this purifier showed 555 grains of H_2S and 650 grains of CO_2; proving that it was still active for purification to the extent of taking out 75 grains of H_2S and 96 grains of CO_2.

Diagram No. 3 shows a plan of the four purifiers with such valve connections as would render it impossible to use them for ordinary lime purification. They were designed and used for oxide purification only, three being in use at one time, and the fourth kept ready for action when required. By using oxygen, the same arrangement is maintained. The gas is admitted into No. 1; passed on through No. 2; and finally through No. 3 on to gasholder—one being kept in reserve ready for use in its turn. When No. 1 is done, No. 2 becomes No. 1; No. 3, No. 2; and No. 4, No. 3. No. 1 being cleared and recharged, the same order commences again and is continued. The test for foulness is carbonic acid ($C O_2$) in equal quantity at the outlet as at the inlet. The test by Sheard's apparatus is rendered a simple one, taking but a few minutes of time. This test should be made on the first and last purifier—the first to make sure the lime is perfectly inert, and the last to avoid passing unpurified gas. This latter event is made impossible by always keeping a completely clean purifier in front of the one that shows the slightest trace of foulness at its outlet; and this again is rendered doubly practicable by the fact that the presence of oxygen so intensifies and quickens the action of the material, and so greatly shortens the time of contact necessary for perfect purification, that the operation is only spread over one-third of the area usually required in ordinary lime purification. This will be made plain on reference to the diagram. As you see, the size of each purifier is 14 feet by 14 feet. The second in the series was the first brought into use as No. 1, and remained in action 40 days before being finally thrown out, passing during that time over nine million cubic feet. Now, if you follow the diagrams, you will be able to make this contraction of area in purification clear to yourselves. These three purifiers were each charged with twelve yards of slacked chalk lime, not 60 per cent. of which was caustic. Two of these were brought into action at one time. For the first six days no impurity (either sulphur or carbonic acid) was visible at the outlet of the purifier used as No. 1. On the seventh day there were 98 grains carbonic acid (CO_2), and 140 grains of sulphuretted hydrogen (H_2S); the inlet of the foul main showing at the same time 790 grains carbonic acid (CO_2), and 600 grains sulphuretted hydrogen (H_2S), and the sulphur in other forms in the purified gas was under six grains. On the seventh day, therefore, the purifier used as No. 2 commenced to work, and no carbonic acid (CO_2) or sulphuretted hydrogen (H_2S) was found at the outlet of this purifier until the fourteenth day. Therefore it was not until the fourteenth day that the purifier used as No. 3 commenced to do work; and this purifier, twenty-nine days after No. 1 commenced working, gave 5 grains of sulphuretted hydrogen (H_2S) at its outlet, and not a measurable quantity of carbonic acid (CO_2), No. 1 not yet being quite exhausted, although it had passed more than eight million cubic feet. Thus the gas purified from all impurities—viz., carbonic acid (CO_2) sulphuretted hydrogen (H_2S), and sulphur compounds (CS_2) to June 3, was equal to more than half a million cubic feet per yard of caustic lime. The total sulphur in the purified gas did not at any time exceed 8 grains per 100 cubic feet, as long as the proper proportion of oxygen was admitted and ordinary purification was not interfered with for other experimental purposes. Now, these facts prove beyond doubt—

(1.) Instantaneous action of oxygen.
(2.) Fixity of the sulphur in the lime.
(3.) That with oxygen a greatly reduced area is required.
(4.) Economy in lime.
(5.) Economy in labour.
(6.) Simultaneous and perfect purification from carbonic acid, sulphuretted hydrogen, and sulphur in all forms.
(7.) Easy and absolute control of the sulphur compounds without trouble or anxiety.
(8.) Complete immunity from anything objectionable whilst carrying out the operation.

To fully understand the importance of this statement, let us suppose we desired to purify the Ramsgate gas by the ordinary lime process; how would this affect the purifying space? First, there must be at least three carbonate boxes, two sulphide boxes, and four iron boxes—just double the number of boxes at present in use for lime with oxygen; and it is needless to say they must be of considerably increased area, otherwise the extravagance in lime used would be ruinous. I think this finally disposes of the area question raised quite rightly last year as a point that needed consideration and decision—indeed it was suggested during the discussion of last year's paper, as a possible answer to the extraordinary experimental results obtained at Westgate, that they were secured by the assistance of undue area, impracticable in general practice. To accentuate this point, so that it may not be raised again in the future, the author would remind you that the make of gas at the Ramsgate Gas-Works is approaching 120 million cubic feet per annum, and last winter, when we were depending on oxide purification alone, and admitting 0·75 per cent. of air, one of these 14-feet purifying boxes was changed daily.

The diagrams are marked plainly to show the position of the carbonic acid and sulphuretted hydrogen on June 3. It is only necessary to say that the carbonic acid in the Ramsgate gas averages, after scrubbing and washing, a trifle under one per cent. (about 800 grains), and the sulphuretted hydrogen, after receiving similar treatment, averages 600 grains per 100 cubic feet.

An important point was also raised with regard to the effect of air on the illuminating power of coal gas, when used as a purifying agent, and also an equally important point as to how far air in purification can be made to do the work of pure oxygen. Now, with regard to the first of these points, the author made careful investigation, detailing the result plainly in the paper read last year; and these results were as close as may be with the teaching and practice of the last thirty years. Several speakers, however, ignored the effect of air on illuminating power, asserting that a certain percentage used in purification had no deleterious effect on the luminosity. Special attention was therefore directed to determine this contention, with the result of giving an emphatic repetition of last year's experiments, and showing a previous understating rather than otherwise. The following is the accurate result of further investigation.

Prior to using oxygen at Ramsgate, oxide of iron was wholly depended upon for sulphur purification, lime purification under ordinary conditions being rendered impossible by reason of area and number of purifiers, as well as the ruinous effect on a town used as a health resort by the nauseous smell engendered while changing ordinary lime purifiers. I am able, therefore, to state positively from returns made from day to day, that the illuminating power of the gas at Ramsgate has averaged for years past, with oxide purification and 0·75 per cent. of air, 13·5 candles; the coal used being "Pelaw Main," and the make over 10,000 cubic feet per ton—the additional 2 candles required to raise the illuminating power to 15·5 candles being made up with about 2½ per cent. of cannel, the cannel used being "New Boghead" or Tyne cannel. Now, since we changed over to lime and oxygen, the illuminating power has ranged between 16·5 and 17·3 candles, and no cannel has entered our retorts. Special attention was called to this fact in the paper read before the Southern District Association of Gas Engineers on the occasion of their visit to Ramsgate on May 9, and it was abundantly proved during the day; the illuminating power and purity being both tested at the author's request. Therefore, allowing that the increase of one candle is due to the removal of the 1 per cent. of carbonic acid by the lime, it leaves 2½ candles to the credit of the use of 0·6 per cent. of oxygen, and the discontinuance of 0·75 per cent. of air. It was thought desirable, however, that the effect of oxygen as against certain percentages of air on illuminating power should receive some further confirmation. A gasholder was therefore set aside to receive the gas treated with 2½, 3, and 5 per cent. of air respectively. Each percentage was allowed to act on the whole of the gas made for six hours—that is to say, the 2½ per cent. was passed into the gas before entering the lime boxes for six hours, and conducted to a separate holder shut off for the time being from the district. After the gas had been stored it was tested; the holder was then cleared, and the next experiment proceeded with under similar conditions to the first. The recorded effect on the illuminating power, as compared with that obtained while using oxygen, is shown by the following figures.

2½ per cent. lowered the illuminating power to 13·45 candles
3 " " " " " " 13·04 "
5 " " " " " " 10·59 "

The gas in the large holder supplying the district was 17·3 candles when the experiment in each case was commenced; and half an hour after the completion of each experiment, when oxygen had again taken the place of air, the illuminating power rose to the normal 17·3 candles. Nothing could therefore be more conclusive, as to the detrimental effect of air on illuminating power, than this trial.

As will be seen, these experiments are entirely confirmatory of those made at Westgate, but were on a more extensive scale, and therefore more conclusive. But if the practice and theory of the last 30 years are to go for anything, these results must have been anticipated—indeed, on comparing them with those given in King's "Treatise," Newbigging's "Handbook," and Lewis Thompson's observations (made a quarter of a century ago), they are so nearly identical as to fully corroborate each other. The air in these trials was admitted at the hydraulic main and drawn through the foul main running round the whole course of the retort-house with fine wire screens inserted at frequent intervals, through which the gas must pass, giving every opportunity for the carburetting of the nitrogen before reaching the gasholder, if such a thing were possible. But, indeed, it stands to reason that it cannot be carburetted, for if it is necessary to remove the ordinary crude gas, which is a good carrier of hydrocarbons, from contact with the tar at the earliest possible moment for fear of their absorption, how is it possible for hydrocarbons to be taken up as well as carried by nitrogen, which is a bad carrier, anxious to rid itself of what would be a burden at every opportunity? It has been asserted in the hearing of the author that 4 per cent. of air may be, and is used in certain works with good effect and without detriment to luminosity. This statement, however, is directly at variance with carefully conducted experiments and past experience, and can only be established by a direct and incontrovertible reference to the actual data on which it is founded.

This brings me to the second point raised—viz., How far air can be made to do the work of pure oxygen in purification? You have already had described the mode of proceeding for testing the illuminating power whilst air was passing. At the same time observations were made on the effect produced on the lime. It will be remembered that the foul gas contained about 1 per cent. (or 800 grains) of carbonic acid and about 600 grains of sulphur; and as 0·10 per cent. of pure oxygen is necessary to add to the gas for every 100 grains of sulphur, it follows that the 3 per cent. of air would contain the necessary quantity for purification. But mark the result. As already stated, the moment before admitting the 3 per cent. of air, 0·6 of oxygen was passing into the gas (this being equivalent to the quantity of oxygen that is contained in that quantity of air). A very short time after the use of air was commenced, the second purifier showed considerably more impurity at the outlet than the inlet; the sulphur measured in being 620 grains, that measured out 730. Before the end of the day the fourth purifier not before in use had to be requisitioned, and in a few hours more this would have been insufficient to keep the sulphur back; and as we had no more purifiers to use, air was discontinued in time to prevent sulphur entering the clean gas. The carbonic acid maintained its position in the purifiers, but the bi-sulphide rose at the outlet of the purifiers to 20 grains. When using 5 per cent. of air under similar circumstances, the results were analogous excepting that the sulphuretted hydrogen did not go forward at quite such a rapid rate. These last experiments prove beyond doubt the value of oxygen over any possible system of air purification in economy of space, lime, and labour.

Many engineers have, verbally and by letter, asked the author: "Can you give a satisfactory reason, apart from its effect on illuminating power, why air, being a mechanical mixture, does not do the work equally well with pure oxygen?" This is a difficult question, and has received lengthened consideration. It is certain that the transformations taking place in the purifiers are instantaneous, and are due to the rapid oxidation of the lime compounds, and this rapid oxidation is only set up by the action of the oxygen in the absence of the nitrogen. This is shown clearly in the experiments already recounted. An explanation may perhaps be found by comparison, thus: A flame 3 inches long when burned in air, would (all things being equal except the oxygen) be reduced to less than 1 inch burned in an atmosphere of pure oxygen, the intensity of the light being correspondingly increased. Again, take iron smelting. Iron may be exposed to heat in quantity for an indefinite time, with the result of its temperature being scarcely raised to a dull red; but it may be that one-tenth of that quantity applied in intensity would do the work of melting it. Look again at the method here described for the abstraction of oxygen from the air by passing it through heated barium. We know of no substance with a greater affinity for oxygen when placed under favourable conditions. In practice, however, we find that only one-half of the total oxygen is absorbed in passing. These illustrations may go some way to explain why air will not do the work of pure oxygen. To use the simile of the heated iron, in the author's opinion it can never in any form go beyond "dull redness" in purification.

We now come to the fourth division—viz., the advantage accruing from the use of oxygen in the purification of coal gas studied from a commercial, practical, and scientific standpoint. Although the author is aware of the necessity of discussing the commercial point in order that the great advantages of the use of oxygen may be made as patent as possible to all, still he would say at the outset what was said last year—that every engineer can best estimate these advantages for himself in accordance with the circumstances that surround him. One engineer may have just laid down extensive purifying plant, and space to him may not at present be an object of consideration. Another may not be under the operation of the Sulphur Clauses Act (which those who are know to be, with the present mode of purification, a grievous burden), and is satisfied to rely on oxide purification alone for sulphur purity. And in these cases of unlimited space or absence of obligation, engineers may be disposed to rely on a limited supply of air, and may think the use of oxygen with them is not a necessity and can be dispensed with. But the author would assert that, even under these favourable circumstances, neglect of the use of cheap oxygen is an unjustifiable extravagance. This will lead directly to the question: What is the cost for the manufacture of oxygen on a gas-works for purification? You have heard described the simple method by which oxygen is produced at Ramsgate, and many here have seen the plant in operation; but to those who have not seen it, the difficulty will be to convey to them in a sufficiently clear manner the real absence of cost, while giving the positive side of absolute cost.

The arrangement shown on Diagram No. 2 is the one favoured for a gas-works and would necessitate the clearing away of a bed of clay retorts to make room for the steel retorts. The maximum make of oxygen from this number of steel retorts should be 10,000 cubic feet in 24 hours, enough to purify about 1½ million cubic feet of coal gas. They are so arranged as to allow of the withdrawal of such tubes as are not required; and they could be reduced in number so as to leave the top tier or two top tiers as the case may be. The life of the barium with which these tubes are charged is a long one, and the consumption of fuel is the most important question; but this is not great, seeing that the highest temperature is under 1450° Fahr., and the work it does is of the lightest. These remarks are necessary; otherwise the bare statement of the actual consumption of fuel for heating these tubes would without explanation appear fallacious. The present fuel consumption at Ramsgate for the production of 2000 feet of oxygen, by the extravagant plan shown on Diagram No. 1 (rendered extravagant by enclosing the tubes in muffles), is 6 cwt. per day; and at Westminster, where producers of an upright type are used, containing tubes without muffles heated by furnaces designed by the author, the consumption of fuel is only 4 cwt. per day to produce a much larger quantity of oxygen.* These upright producers are found to be much more economical in fuel than where the tubes are placed horizontally; and if they can be conveniently introduced, they will pay for extra cost in construction. The author has in his mind, however, the adaptability of existing gas-works plant to the manufacture of oxygen; and in that light a few bushels more or less of coke used in the retort house before it is handled for sale, cannot be a serious item. The coke for raising steam to drive the pump may be taken at the same quantity as for heating the retorts; the same boiler making steam for the engine driving the gas exhauster.

The first cost of oxygen plant, including pump, retorts, purifiers, oxygen holder, &c., complete, will average from £5 to £10 per million annual make of coal gas according to the size of the works, and even less than the

* It has been found at Westminster that, for a daily make of 10,000 cubic feet of oxygen, a consumption of 14 cwt. of coke is sufficient.

lower figure, where the works are large. The wear and tear is confined principally to the steel tubes containing the barium, and the air-pump and its belongings. It will be noticed that all the covers and pipes of the steel tubes will last a life-time and can be transferred from one steel tube to another as the body is destroyed. These bodies are not costly—about 50s. each. It will be clear to every gas manager that a tube worked at so low a temperature as 1450° will not soon be destroyed. If, however, this should occur twice a year, which is not at all probable, renewals would be but a small item. It is possible, too, that experiments now being practically tried with cast iron may prove successful, in which case the life of the tubes would exceed those of clay retorts. When renewal becomes necessary, one is drawn out and another substituted in its place without disturbing its neighbour. The oil for the air-pump, wear and tear, and the attention needed may be looked upon as one would look upon an extra exhauster.

The author hopes he has made these details clear. If so, it will be agreed that after having made the first outlay for plant, and ascertained what is the cost of the space occupied in the retort house, the maintenance, fuel, and labour, means very little, and cannot average more than from 1s. 6d. to 2s. 6d. per 1000 cubic feet of oxygen according to the size of the works requiring it—indeed, the operation so fits in with the every-day routine pursued in a gas-works, that it is difficult to fix the figure at even this low cost. It may therefore be safely asserted that great economy will result from the use of oxygen in purification by its application to oxide of iron. The absence of the necessity for the frequent opening of the boxes (excepting where one may get hardened, and which can be loosened *in situ*); the avoidance of a shift of material from month's end to month's end until the material is fully spent and charged with 20 to 30 per cent. more sulphur than can possibly be put into it in any other way; the increase of illuminating power which is undoubted as between air and a proper proportion of oxygen; and the immense saving in space from its intense and certain action—all these must leave a very large balance in its favour, even in oxide of iron purification only.

In the case of lime this is still more marked. Indeed, such is the perfection of lime purification with oxygen that oxide of iron purification pure and simple may be regarded in itself as an utterly unnecessary and wasteful process, as by means of 50 per cent. of the lime at present needed, the carbonic acid, sulphuretted hydrogen, and sulphur compounds are wholly removed without trace of nuisance. It is therefore clear that lime and oxygen purification, as far as labour and material are concerned, taken as a whole, cannot exceed the cost of the present system, leaving every other advantage in space, purity, and economy to the credit of oxygen.

The following figures will demonstrate this still further:—On reference to Field's "Analysis of the Principal Gas Undertakings in England, Scotland, and Ireland," the average cost of purification where companies are placed under the Sulphur Clauses Act is £3 15s. per million cubic feet.

This same work, in conjunction with the oxygen in purification, but not including the cost of the oxygen, is . . .	£1	15	0
Cost of 0·6 per cent., or 6000 cubic feet of oxygen at the higher figure of 2s. 6d., which includes all cost except interest on outlay for plant	0	15	0
Interest on capital in providing oxygen plant at £10 per million at 10 per cent.	1	0	0
	£3	10	0
Balance in favour of oxygen . . .	£0	5	0
Add interest on capital due to saving of one-half the space and plant required under the present system—viz., £50 per million, at 7½ per cent.	3	15	0
Add the average cost of 1½ candles in illuminating power, at 1d. per candle; or if the average cost of cannel to maintain the illuminating power of gas obtained from ordinary caking coal at 16·5 candles be taken, it will amount to the same figure—viz., 1½d. per 1000 cubic feet = one million at 1½d. per 1000 feet	6	5	0
Saving per million feet	£10	5	0

Now, if the centre item of £3 15s. be excluded by any engineer because in his case extension of plant may already be in existence, it still leaves to the credit of oxygen £6 10s. per million cubic feet.

The economies of oxygen purification have been designedly understated; the saving claimed having been greatly exceeded at Ramsgate. It is sufficient for the author's purpose to make it clear that the system is self-supporting under all conditions where gas must be purified, and leaving such a margin as to recommend its adoption by all gas companies and corporations.

In conclusion, the author would for a moment refer to the evidence given before the Parliamentary Committee appointed to inquire into the "Sulphur Question" in 1877. It is difficult to harmonize the evidence then given with what is now said as to the impossibility of complete sulphur purification in and about London without creating a public nuisance of an unbearable kind; and the author thinks the limit of sulphur is placed by the Referees unnecessarily high in deference to the opinions expressed in 1877, which were held, and it may be rightly, if dependence must be placed wholly on the sulphiding process, or on the use of a limited supply of air. But in the future oxygen purification, perfect in itself, will allow companies and corporations to comply with every demand made by the Legislature to compel the supply of an article of as great purity as is practicable. The process now described being simple, scientific, less costly, and without nuisance, recommends itself to every engineer; and the author leaves with confidence the future of oxygen purification in the hands of his professional brethren.

Discussion.

Mr. W. W. Hutchinson (Barnsley) said that there was one thing which specially recommended this matter to all companies, and showed the great advance which had been made since last year—viz., the proportional meter that was put into action, by which they were assured that there would be no undue proportion of oxygen introduced; thus preventing any fear of explosion. This matter was referred to last year as being a danger that must be overcome in a thoroughly reliable fashion before gas-works having a varying make could introduce the process. For instance, he might refer to the normal cessation of work on Sundays, and the occasional miss when they were short of gasholder room. If they depended on regular supervision to ensure a certain proportion of oxygen, there might be risk of some lapse at holiday time, owing to want of supervision, and consequent danger both to the plant of their employers and to the inhabitants. This improvement was very important, and would enable many of them to introduce this process of purification who could not otherwise do so. Another important matter was the reduced cost of the production of oxygen. Trusting to his memory, he thought that 5s. was the price mentioned last year. The reduction of 2s. 6d. in twelve months was very noticeable, and would help the movement forward very greatly. He happened to reside at works where he was within 15 yards of the purifying operations. As the purifier was an uncovered one, when the wind was in a certain direction he had to suffer a great nuisance, which he would be extremely glad to avoid; and this seemed to him to be the very thing needed to accomplish that object.

Mr. G. Anderson remarked that towards the end of the paper Mr. Valon referred to experiments which had been made to prove whether or not there was a diminution in the illuminating power of the gas by the use of air; and he stated that he used 2½, 3, and 5 per cent. of air in the different experiments. Now, he (Mr. Anderson) wished Mr. Valon had tried a much smaller quantity; and then the results might have been different. It was a great many years since he (Mr. Anderson) began to use air in gas; and he had never heard of anyone employing more than 1½ or 2 per cent. The question was, if Mr. Valon had used 1½ per cent., would he have had the diminution in luminosity which resulted from employing the larger proportions named? The matter had been very satisfactorily stated by Mr. Valon; and he seemed to have accomplished his object in a manner which would improve the purification of gas so as to meet all the requirements of the public. Mr. Valon had referred to some extent to the cost. But he (Mr. Anderson) did not think he had done so sufficiently; and perhaps when he had had a year's further experience, and his accounts came out, he would be able to give the members more information. It occurred to him that the steel tubes used by Mr. Valon might

not last very long in oxygen. Of course, there was probably no humidity present, and therefore the tubes would last longer than they otherwise would do. But this was a question to be proved; as, if they did not last, it would add considerably to the expense. Did he understand Mr. Valon to say that he had purified 11 million feet of gas by one purifier, 14 feet square, into which he put 4 yards of lime?

Mr. Valon said no; there were 12 yards of lime, and 9 million cubic feet of gas passed through it.

Mr. Anderson said no doubt this was good purification by lime. The quantities were rather large; and the lime came out without smell, which was a very important matter. Many years ago, when he had the Dover works, they used sometimes to have the lime come out so pure that there was really no smell from it; and instead of being in the form in which it was ordinarily seen, it was more like sponge-cake from a confectioner's. Mr. Valon had referred to the parliamentary inquiry in 1877, when the Gas Referees and the London people were at loggerheads about sulphur in gas. He (Mr. Anderson) was engaged on that inquiry, and sent down to Dover for a lump of the foul lime as they had been using it (it was generally used to a depth of 12 inches on each tray). A large piece of it was sent up in a box; and on the day he was going to be examined he took it with him to the Committee-room, and put it under the table. At the proper time he had the box taken out, the lid removed and the contents laid before the Committee. No one complained of that lime—in fact, no one knew it was in the room until he opened the box. He remembered Dr. Odling saying: "Where does the sulphur go? It is a thing you cannot crush into nothing." He (Mr. Anderson) replied that it was not, and that he did not know there was anything else besides sulphur which one could crush into nothing; but if Dr. Odling would go down to Dover, he could witness the process, and see whether or not they were without the slightest difficulty getting the lime in the state he had shown it. At the time they were using lime without any smell. They brought it nearly to a carbonate; but there was a little difficulty sometimes. In the rotation of the purifiers, there would occasionally be one which had a rather stronger smell, while the others were free from it. This was perhaps due to the arrangements not being so perfect as they might have been. When they were using air, in order to get at the proper quantity, they kept two jet burners alight alongside each other—one supplied with the gas as sent out to the public, and the other with the gas they were making. They were governed so as to give exactly the same height of flame when things were all right. If they used the least quantity of air more than was intended, they found that the height of the flame decreased; and this was an immediate check on the use of air. He felt that, although the oxygen process was a very good plan, there were other ways of arriving at perhaps not quite so beautiful a result, but still one which would be satisfactory, and could be obtained without the expense of manufacturing oxygen. In a paper he was going to read later on, there would be found the results of using air in gas purification; and since this had been introduced, the purifiers, he might safely say, went on for double the time they worked previously. With this before them, it would be some time before they would all use the oxygen process. Still they were much obliged to Mr. Valon, who had done a majestic work in pushing on this matter; and he (Mr. Anderson) hoped he would in another year be able to give more details of the actual expenditure. He said that it took one bench of retorts to provide the oxygen; and this meant something in fuel. In addition, there was the pumping of the air, and the pumping of the oxygen after it was made, which was also a thing to be kept in view. These were little things which might not be of much importance in large works, but which would form a considerable item in small ones. Another question he would ask Mr. Valon was whether he extracted the carbonic acid gas from the air before or after it had passed through his retorts?

Mr. Valon: Before.

Mr. C. S. Ellery (Bath) said there were one or two points which he wished to refer to, as this was a matter in which they were largely interested at Bath. The most important point in the paper was the one already touched upon—namely, the nuisance arising from the ordinary purifiers; and he should like Mr. Valon to say whether in opening these purifiers, after they had been running the time mentioned, there was an utter absence (comparatively speaking) of the extreme offensiveness which ordinarily attended the opening of purifiers. They had been using for some time a percentage of air; and some were inclined to think after the boxes had been shut up for a length of time, as was the case where air or oxygen was used, that when they were opened there was a greater stench given off than where the ordinary purification was carried on without the agency of either of these helps. The paper would lead anyone to suppose that the use of air in any proportion reduced the illuminating power of the gas; but that was not their experience. He could well believe that 5 per cent. would most seriously interfere with the illuminating power, and that even 3 per cent. would do so; but where it was about 1 per cent., by turning on the air one day and turning it off another—which was a very fair test—he could not himself find that the illuminating power was affected. It might be that the use of different coals, or the construction of the plant, had something to do with the different experiences at Ramsgate and at Bath. But his experience certainly was that the use of air in comparatively small proportions was not detrimental to the illuminating power of the gas. Another important question was this—whether after the boxes had been in use for some time, the material became so hard as to raise the pressure. Some of them would find it inconvenient to have a material increase of pressure in their works in mid-winter, especially in works where they had already to deal with considerable pressures; and he could not help thinking that where the material lay in the boxes for the length of time it appeared to do, the pressure must be considerably increased by the material hardening. He saw that Mr. Valon shook his head; and he hoped such was not the case. He desired to thank Mr. Valon for having brought this paper forward, which seemed to touch one of the most important points in gas-works' management; and if the day of using closed vessels for purification was as near as it appeared, he should feel greatly relieved. Before sitting down he would ask Mr. Valon, Did he suggest that the use of oxygen increased the illuminating power of the gas—that was to say, supposing a particular coal (without any cannel) made 15-candle gas, did he consider that, by using oxygen, the illuminating power was increased?

Mr. N. H. Humphrys (Salisbury) remarked that, as the steel tubes only needed to be kept at a temperature of 1400° Fahr., he did not see why they should require a separate furnace. Why, he asked, could not they be put in the main flue at the back; and so use up some of the waste heat which escaped from the retorts? He understood Mr. Valon to claim that, by using oxygen by itself, there was some great superiority—that it was very much more active than when mixed with air; but he failed to follow that point for this reason, that at the inlet of the purifiers there was ½ per cent. of oxygen, and 99½ per cent. of gas. At the inlet of his purifier, he might have ½ per cent. of oxygen, and 99½ per cent. of other gases. The only difference therefore was that in his 99½ per cent., there was 2 per cent. of nitrogen. He could not see how the 2 per cent. of nitrogen was going to interfere with the activity of his ½ per cent. of oxygen, any more than 2 per cent. of hydrogen or marsh gas, or whatever other constituents might be present. With regard to the avoidance of nuisance by the use of air, he considered that to be fully proved in his experience. Their purifier-house was surrounded by dwellings; and they had to be very careful on this point. That was one reason, if there were no other, why he should use air to reduce the nuisance. On one of the diagrams to be afterwards referred to in connection with his own paper,* there was a space marked out in the centre which he would explain. It showed the efficiency of a purifier which had been in use 224 days; and through which more than 30 million cubic feet of gas had been passed. It was an oxide purifier; and when the box was opened, there was not the slightest smell from it. He stated at the last meeting that he did not consider the use of air interfered with the illuminating power of the gas; and he still thought so. He had maintained the quality of his gas at the usual rate—15 to 16 candles—during the last three years, during which time he had been trying various quantities of air up to 1½ per cent. This was the highest amount his apparatus would pass without using any extra cannel whatever; although he had a supply of cannel, and was at liberty to use it if necessary. So that, while accepting, without any reservation, Mr. Valon's experiments as they applied to Ramsgate, he could not accept them as applying to Salisbury. Compensating circumstances came in. He found that the use of air increased the

* See page 51.

temperature of the purifiers a little; and as his purifiers were situated in a very cold place, there was a little chilling of the gas, and a little loss of illuminating power in the purifiers. Now the use of air, by slightly raising the temperature, avoided that loss. In ordinary experiments it had been tried over and over again; and it was a fact that if pure gas were mixed with 1 or 1½ per cent. of air, it was possible to trace a certain diminution of illuminating power, but in practice he did not consider it had any such effect.

Dr. L. T. Thorne said he should like to refer to one or two points which had been raised by the paper. In the first place, he would take what they would all recognize as perhaps the most important point, at least from a theoretical point of view—the question why oxygen should have the effect stated, when air did not. Putting aside for a moment all considerations of illuminating effect, the question became: Why if they put into the gas ½ per cent. of oxygen in a pure state that should have such a great effect, compared with ½ per cent. of oxygen when it was put in in conjunction with about 2 per cent. of nitrogen in the form of air? He admitted at once that there was great difficulty on this point; and it was one which he certainly had not yet been able to explain satisfactorily to his own mind. At first, he was inclined to be very sceptical about the possibility of it. But experiments were made at Westgate which showed that effect; and when they were continued on a large and regular scale at Ramsgate, it became still more marked. As Mr. Valon had mentioned, the supply of pure oxygen had occasionally been stopped, and the same quantity put in in the form of air; the quantity being slightly modified so as to obtain two or three ratios—3 per cent., which would contain just the proportion of pure oxygen that he was using, and 5 per cent., which would give a rather larger percentage, were employed. In all these cases, as soon as the air was used to replace oxygen, there was a remarkable change in the action of the purifiers. In those partly fouled purifiers in which pure oxygen was being used, and the percentage of sulphur in the incoming gas largely reduced, the substitution of air stopped the reduction at once; and after a short time the gas actually issued from the purifiers more impregnated with sulphur than when it entered. Not only was this the case, as might have been expected when the purifier was just getting to the end of its tether, so to speak, but on stopping the air supply, and re-admitting pure oxygen, the deterioration of the gas ceased almost immediately; and in the course of an hour or so, when the oxygen could work through the purifier, the latter began to do good work again, and reduce the amount of sulphur. These experiments, which had been tried over and over again at Westgate and at Ramsgate, proved conclusively that the oxygen by itself had a different effect to what it had when in the form of air. What was the cause of this difference was more than he could at present say with any certainty; but they knew so many instances in chemical work where small quantities of foreign gases had marvellous effects, that he thought the explanation would have to be sought somewhat in that direction—viz., in the influence of small masses of gas on reactions. He might mention one or two instances to illustrate this point. One, which had occurred to him recently in connection with Brin's Company was this: He had been attempting to use air to aid the bleaching of paper pulp with bleaching powder. Using a bleaching powder solution, air was passed in whilst the bleaching was going on; and the effect was nothing—the quantity of powder required was just about the same whether the air was passed through or not. In fact, sometimes the effect of the air seemed to be rather detrimental. But on employing pure oxygen, the effect was very marked; and he was able at once to save something like 40 per cent. of the bleaching powder required to bleach the pulp, and in some cases more than 50 per cent. was saved. There the difference was undoubtedly due to the effect of nitrogen. In this instance, however, he readily admitted that the nitrogen would naturally have a greater influence than one would expect in the case of coal gas, because in the bleaching experiments, the air or oxygen was unmixed with other gases. But the effect was so marked that it tended to show the possibility of such variations occurring. He might also refer to the remarkable work which had been done recently on the influence of minute traces of foreign matter on combustion, and on the action of gases generally. They had been accustomed to look upon oxygen as a wonderful supporter of combustion; and they all knew that if an ordinary combustible substance was set fire to in an atmosphere of pure oxygen, it burnt very brilliantly—for instance, sulphur, carbon, iron, and so on, burnt brilliantly in oxygen; much more so than in air, where the nitrogen had a diluting effect. But the chemical world was startled some few years ago by experiments made by Professor B. Harold Dixon (now of Owens College, Manchester) and others, in which it was shown that if the oxygen were perfectly dry—in a state of dryness such as until that time had been quite unknown—then the power of the oxygen to support combustion was enormously decreased. One might heat sulphur in *dry* oxygen to such a point that it sublimed, without its burning; and one might heat a piece of charcoal in oxygen to a bright-red heat, take the flame away, and it would go down black again without any visible burning. But the moment the merest trace of moisture was introduced, the effect was quite different; the carbon, or sulphur, or phosphorous, or whatever it might be, immediately burst into flame. This might be shown very remarkably in this way: If you had a vessel containing absolutely dry oxygen with a small piece of carbon, and also a thin bulb containing a single drop of water in it, you could heat the carbon to a bright red heat, and no combustion would take place. The carbon might be allowed gradually to diminish in heat until it became barely visible red; and then if, by a shake, you broke the glass bulb containing the water so that moisture came into the oxygen, the carbon flashed out at once. A similar action might be shown by introducing a strip of Dutch metal into an atmosphere of perfectly dry chlorine. The Dutch metal might be kept in this atmosphere for months—he had himself seen a strip of Dutch metal kept for six months in a jar of dry chlorine—and in the same jar a small thin bulb containing a drop of water. When the jar was just agitated enough to break the bulb, instantly there was a flash, and the Dutch metal was acted upon, and formed chlorides of its various constituents. These instances showed the remarkable effect of small quantities of matter under certain conditions; and he believed that some such explanation must be the true one of the cause of the results which Mr. Valon had obtained. He had gone into the matter very carefully, and certainly there seemed to be no escape from the fact that these results were effected; and equally certain it was a point to be kept in mind how they were to be satisfactorily explained. He believed that this was the direction the explanation would take, though he fully admitted it was not complete. Still the facts were there; and they were bound to take the facts, and wait for the explanation if they could not obtain it at once. Referring to the effect of oxygen on the illuminating power of the gas, there could be absolutely no doubt on that question. If you had such a percentage of oxygen in the purifiers that you had a small percentage of oxygen passing on into the purified gas—if, for instance, you used, as Mr. Valon did, 0·6 per cent. of oxygen, and 0·5 per cent. was enough to do the actual purification, so that 0·1 per cent. passed on into the gas—it was an absolute necessity, judging from the experience of all experimental work on the subject, that there must be an increase in the luminosity of the gas. On the other hand, if air was employed, so that the greater part of the oxygen was used up, they had the 1 or 2 per cent., or whatever the quantity might be, according to the amount of air used, of nitrogen in the gas; and this must produce a diminution of the illuminating effect. Of course, it was possible that under certain conditions of works there might be compensating influences, such as Mr. Humphrys had mentioned, where the purifiers were themselves doing harm to the gas, which might be lessened even by an inert gas. But, as a general rule, the introduction of air must have a decidedly deleterious effect on the illuminating power. The other points referred to would probably be more readily handled by Mr. Valon than by himself; but he might mention that numbers of experiments had been made on the effect of decreasing the illuminating power by inactive diluent gases, and in all cases the same effect had been found. The reduction was produced by all gases that were inactive; and, of course, nitrogen must be included in that class. It was inactive; and its presence acted entirely as a cooler and reducer of the temperature of the flame, and of its luminosity. All gas managers knew in their own experience how harmful the influence of carbonic acid was. Of course, there they had a still more harmful substance than nitrogen, because the amount of heat taken up by carbonic acid in being raised to the temperature of the flame was greater than that taken up by nitrogen; the specific heat of carbonic acid being nearly half as much again as that of nitrogen. But it was merely a matter of degree; and just as every manager knew that if he had carbonic acid in his gas he necessarily reduced the luminosity of it, so it was with

nitrogen, moisture, and other inert gases, which had no influence on the actual burning of the gas, but reduced the luminosity. It was different with oxygen, however, because there they had an active agent which helped the combustion of gas, increased the temperature, and necessarily increased the luminosity.

Mr. R. Herring (Dover) said he understood Mr. Humphrys to say that, with his apparatus, he could only introduce 1½ per cent. of air. He wished to know if Mr. Humphrys would use a larger percentage if circumstances permitted, as 1½ per cent. seemed to him (Mr. Herring) rather small.

Mr. Humphrys said he should have no objection to increasing it a little more. He always carefully measured the air through a wet meter; and that was an important point—it must be very carefully measured. He certainly should have no objection to increase it another ½ or even ¾ per cent., if he found it necessary, or had the means of doing so. He might perhaps be allowed to explain that he thought Dr. Thorne scarcely appreciated his point, which was this: They all knew that pure oxygen, as compared with ordinary air in an undiluted state, had a great effect on combustion and other chemical operations; but his point was that Mr. Valon was using 99½ per cent. of gas and ½ per cent. of oxygen, whilst he also used 99½ per cent. of gas and ½ per cent. of oxygen. It however happened that he had 2 per cent. or so of nitrogen in his gas as well; and he could not see how this 2 per cent. of nitrogen could make any practical difference, as compared with 2 per cent. of hydrogen or of anything else.

Mr. G. Anderson said he should have stated before that he made experiments a great many years ago, as to the effect of introducing air into gas, with reference to its illuminating power; and the result of a number of experiments was this—that 17½ per cent. of air reduced the ordinary gas supplied to the public down to one candle. It was thus possible that the 2 per cent. of nitrogen Mr. Humphrys spoke about might have a very sensible effect on the illuminating power.

Professor Foster said the question about the dilution of gas with air which he alluded to last year, or rather the ingress of air prior to the passage of the gas away from the presence of tarry vapours, was not quite the same thing as mixing air with ordinary purified coal gas. Speaking for himself, it was quite an open question at the present moment, but one most pertinent with reference to the use of apparatus such as had been described. He thought it would be well for them all to keep an open mind as to the influence of a gas like nitrogen (although it was "inert") when there were vapours of liquids capable of being diffused into it. The reduction of illuminating power which followed the admission of a certain amount of nitrogen would not proceed *pari passu* under the two different conditions which he had suggested. He believed one would get a greater decrease of illuminating power by mixing gas after purification with air, than by allowing the same proportion of nitrogen to enter the hydraulic main where it could become saturated with the vapours of the hydrocarbons of the tar. Mr. Valon had gone very carefully into the question of area, and had settled to his own satisfaction the point which was raised last year, as to the relation of the material to the quantity of the sulphur impurities passed through it. Having regard to the question of purification only, he (Mr. Foster) did not feel at all sure about the admission of air in place of pure oxygen; and he would rather not discuss it, though no doubt it was a matter which must be settled. So far as illuminating power was concerned, pure oxygen would have the advantage. It appeared advisable in cases where air was employed, to introduce it in such a way that the reduction of illuminating power should be as small as possible—that was, by allowing the nitrogen to become saturated with hydrocarbon vapours.

Mr. Hutchinson said he should like to ask a further question. Did Mr. Valon recommend the use of lime, as against oxide, in this process; and was the sulphur produced recoverable in the lime in a commercial form? If not, there would appear to be a prospective loss to the country of the sulphur now recovered by using oxide, and used in the production of sulphuric acid. They would have to purchase from other countries that which was now produced at home.

Mr. A. Edwards (Taunton) said he understood it to be put forward that 0·6 per cent. of oxygen was used for the purpose of purification, and that possibly only 0·5 per cent. was actually required; so that there was a surplus of 0·1 per cent. passing over with the gas, and that was supposed to increase the illuminating power (if he rightly understood the figures) to the extent of something like 2 candles. He might be wrong; but, at any rate, some considerable increase of illuminating power was claimed for this process; and Dr. Thorne had explained that it might arise from using more oxygen than was necessary, which passed over with the gas. That was a point which ought to be easily determinable by direct experiment. He presumed that the mixing of oxygen with the gas after it was made and stored, or mixing it at the point of combustion, would very readily determine to what extent the increase of illuminating power was attributable to the presence of free oxygen in the gas as burnt; and he should like to ask whether experiments of this nature had been made, and, if so, whether the results could be given.

Mr. S. R. Ogden (Blackburn) said he could not allow this paper to pass without saying how much obliged he felt to Mr. Valon for bringing the subject forward; and he could assure him that, when he had leisure, he should study it very carefully, seeing that he was considerably interested in this process—he believed he was the first to try it. It was from no diffidence on his part, but from the neligence of Mr. Ellice-Clark, the Engineer to Brin's Oxygen Company, that they had not got the plant for making oxygen erected at Blackburn at the present time. They contracted with the Company to put up the plant at the same time that they contracted with Mr. West to put in stoking machinery; and he was only sorry that Mr. Valon had taken this matter out of his hands. But he was very pleased he had brought it to so successful a result.

Mr. Ellice-Clark said, as he was the unfortunate gentleman to whom the last speaker had alluded, he should like to explain how it was that there was not an oxygen producer at Blackburn. His Company certainly, if not the gas world, owed a considerable debt of gratitude to Mr. Ogden for having been the first to introduce it in his works, and carry on a series of experiments for three or four months, showing what value or otherwise oxygen had in the purification of gas; and Mr. Ogden was so convinced from the experiments he carried out that, as he stated last year, a contract was placed in the hands of the Town Clerk of Blackburn and the Solicitor of the Brin Company. Without going into details, he might say that the obligations which were cast on his Company by the Corporation were exceedingly severe—amongst them being one, the effect of which would be that they should not get any money out of it at all. So that, although they felt that they did owe a debt of gratitude to Mr. Ogden, they could hardly comply with the request of the Corporation. But he hoped that Mr. Ogden—having satisfied himself, and having heard what Mr. Valon had to say on the subject—would proceed to erect a plant at Blackburn. He might further mention, in justice to Mr. Ogden, that they would have carried out the whole of the experiments in Blackburn if that town had been nearer the site of their operations. Had they been a Manchester or Lancashire Company, they would no doubt have gone to Blackburn and not to Westgate. It was simply on account of the proximity to their works of the Westgate Gas-Works that they went there.

Mr. J. Niven (Clayton) said he should like to make one remark with respect to the admission of atmospheric air. The reason he began to use air was the smallness of his purifiers. He admitted that 1½ per cent. deteriorated the gas considerably; but if he kept to about 1 or 1¼ per cent., he did not lose anything by it. He must say that the oxide came out in a very hard mass, so that they had to use a pick to remove it. He then finished with the lime, and found that it came out as white as paper.

Mr. D. Irving (Bristol) could not refrain from observing how difficult or impossible it was to discuss a technical paper of this kind without ever having seen it in print. The members could not even make a note of the various figures which were read out; and it was next to impossible, therefore, to get up and discuss them, which put them under a very great disadvantage. He could see there would be certain difficulties about sending out proofs to all the members beforehand; but still it was a matter which he thought the Institute ought to deal with. They could never have an exhaustive discussion on figures unless this were done; and he hoped the Council would take the matter into consideration. Proceeding, he said they were all much indebted to Mr. Valon for his very able and painstaking paper; and whatever might be the difference of opinion with respect to using oxygen and air, they must all acknowledge that the oxygen method now suggested was a more accurate and scientific way of supplying oxygen to the purifiers. He had used air, and could fully substantiate all that Mr. Humphrys had said up to 1 per

cent. But they must admit that to get the 1 per cent. of oxygen from the air, they had to put in 4 per cent. of inert nitrogen, which, if there were no other compensating circumstance, must reduce the illuminating power of the gas. He was much surprised to hear it stated by Mr. Valon that the oxygen process increased the illuminating power; and it had been suggested that this was gained by an excess of oxygen. He contended that any excess of oxygen would have an opposite effect, and would reduce the illuminating power; and anyone could try the experiment for himself. The question of the general adoption of this process must be left to each individual member to judge for himself. Anyone situated as he was at present, with ample purifying power, would have no difficulty whatever in keeping his sulphur within 10 grains; so that to him the process would be of very little use.

Mr. Valon, in reply, said there had been rather a long discussion, but not longer than he had hoped for. Therefore, if he should omit to reply to any point which had been raised, it would only be by inadvertence, and he should be glad to answer it either by personal correspondence or through the press. Mr. Hutchinson asked whether it would not possibly be a loss to the country if the sulphur retained in the lime could not be recovered commercially. At the present time, each yard of caustic lime would contain 17 to 20 per cent. of sulphur, which would not be enough, even if it were in oxide of iron, to make its recovery profitable. No doubt some use would be found for it; and he did not say that at present the sulphur in lime was lost. But with regard to oxide, if the lime did the whole of the work, they all knew that the oxide would not more than recoup itself for what it might be sold for. Therefore, there was no advantage in using it for the sake of using it. From the gas manager's point of view, it did not matter whether or not the manufacture of sulphur went out of the country; and they would be rather Quixotic to use oxide unless it was quite necessary. With regard to the proportional meter, of which Mr. Hutchinson spoke so favourably, it was very simple; and there was no doubt of its acting properly. Mr. Anderson had told them about the lime he took to the Houses of Parliament; and there was no doubt it was an absolute fact. But there was one point to be remembered, that Mr. Anderson's lime was pure carbonate, whilst the lime they took out at Ramsgate under the oxygen process was not pure carbonate, but had the sulphur fixed in it—a thing which had been hitherto unattainable by any other process. Of course, in using air, an uncertain quantity of sulphur (a small quantity) was fixed; but with oxygen the whole of the sulphur was fixed in the lime, so that lime in quantity sufficient for taking out carbonic acidwas more than sufficient to take out the sulphur in the gas at one and the same time. Hitherto, if there was sulphur as sulphide in the lime in any quantity, the lime was an intolerable nuisance when removed; but if it was fixed by oxygen, you could take it out, and take it to the same place that Mr. Anderson took his to without objection. The life of the steel tubes was a great point; but they knew they would last many months, because they had been using them for two or three years under rather severe conditions. Still there was no finality at the present moment in the manufacture of oxygen; and they hoped to simplify it even more than at present. Cast-iron tubes were being experimented with; and, if successful, the life of an oxygen retort would exceed that of the clay retorts used in making coal gas. If these failed, other experiments would be carried on until they lengthened the life of the retorts as far as possible; and every other part of the machinery in connection with the manufacture of the oxygen was simplicity itself. Mr. Ellery had asked whether the material when removed from the purifiers was perfectly inodorous. He (Mr. Valon) might adopt his very words, and say that there was in the material, when removed from the purifiers, an utter absence of smell—no more smell than there would be with properly carbonated lime not containing one particle of sulphide. Of course, when the purifiers were opened, there was a smell of the foul gas in the purifiers to be got rid of; but the material itself was quite innoxious, and might be handled by the workmen in safety, without danger to their eyesight. If any gentleman desired a sample, and would send him a post-card, he should be pleased to forward a lot of any size he might desire to experiment with. With regard to the distinction between the use of air and oxygen, which he had already plainly said was a difficult question, if Dr. Thorne could not explain it satisfactorily, he should be a very bold man indeed to pretend to do so. He could only argue from induction. With regard to the pressure caused by the boxes running such a long time, he might say that there again was another peculiar fact. The addition of air hardened the material, and caused such a tremendous back-pressure that it was necessary to change the purifier before it would be otherwise needed. But in using oxygen, the material was formed into a porous spongy kind of mass; and in using four purifiers, the rise of pressure in 45 days (from the time the material was first put into the boxes until it was taken out) was only 3-10ths or 4-10ths—certainly not half-an-inch. There again, if any gentleman had the interest to look at the material, he would see that it was a perfectly cellular kind of formation, which the gas easily passed through; and nearly every particle of the lime was thus acted upon by the oxygen in going through it. Mr. Humphrys had suggested the use of waste heat for the purpose of heating the steel tubes; and he was perfectly certain that Brin's Company would be very glad to entertain any mode of heating by waste heat which would cheapen the production. With regard to illuminating power, he had made many hundreds of experiments. It was clear that 0·75 per cent. of air did not reduce the illuminating power so much as 1½ or 2 per cent. Out of two evils he should choose the least, and would rather use 0·75 per cent. than a larger quantity. If proof spirit was taken, and a certain quantity of water put in, it would show instantly it was reduced in strength, which proved that any part of the water whether observable or not, must to a certain extent dilute it. In this case all he could say was that it was putting into the hands of the public a very dangerous weapon indeed if gas managers told them they could put 2½ per cent. of air into the gas without reduction of the illuminating power. Where could there be a stronger argument for an alteration of the photometrical scale than the statement that 2½ per cent. of a diluent gas could be put in, and it would not show on the photometer. They should certainly be very careful how they allowed such a statement to go forth. At the same time, he must say that his experience was totally against it. He quite understood that if it was not desired to find the half or three-quarters of a candle depreciation when using 0·75 per cent. of air, no doubt it would be managed. He could manage it himself; but in discussing matters there, they wanted to elicit the truth, and not to hide the fact that it did diminish the illuminating power. If 1½ or 2 per cent. brought down the illuminating power, it must follow that 1 per cent. must bring it down in proportion. One could not get away from the fact, or hide it, by saying that the illuminating power was as high as before, because as a matter of fact it was impossible for it to be so. He had given the results of the tests made, and could not be so bold as Mr. Humphrys, who said he would not mind using 2½ per cent. of air. To him (Mr. Valon) that would seem like putting his hands into the pockets of the companies or corporations they represented, taking their money out, and throwing it away; because to put in air to that extent must lower the illuminating power, and thus make the cost of purification very extravagant. They went to very great expense in providing lime to take out the carbonic acid, apart from sulphur compounds, Why? In this case simply because it was an inert gas, which lowered the illuminating power 1½ candles. They took out 1 per cent of carbonic acid, and admitted 2½ per cent. of nitrogen, yet in weight 1½ per cent. of nitrogen equalled 1 per cent. of carbonic acid. How could they possibly explain that? He could not do it; and he thought if the gentlemen who had not yet seen any effect on the illuminating power by the admission of air would make more careful analyses, they would agree with him. Professor Foster had made some remarks, and had suggested something with regard to the making of air experiments to carburet the nitrogen on passing air into the gas. His (Mr. Valon's) paper gave the mode in which it was endeavoured to do this. The air was admitted at the hydraulic main. It was drawn through fine wire screens inserted in the foul main running round the whole length of the retort-house; and the gas then passed through the condenser to the exhauster. The air thus kept in contact with the gas from the time it entered the hydraulic main until it reached the purifiers; and, therefore, if it was possible for the nitrogen to be carburetted under any conditions in gas-works, it was certainly under these conditions.

Professor Foster remarked that he said it might be that, by introducing air for the purpose of purification, the reduction of illuminating power would not be in the same degree as if it were mixed with the purified gas.

Mr. Valon said he had perfectly followed the argument. What he said was that the experiments he had made clearly

showed that air admitted under the very best conditions reduced the illuminating power after the attempt had been made to carburet it as far as possible. Therefore, any further experiments without carburetting or with purified gas must show (if attempted carburetting did any good) greater depreciation than that stated in the paper.

The PRESIDENT said he had been thoroughly pleased with Mr. Valon's paper. As an old chemist, who began making oxygen 57 years ago from oxide of manganese, and going on through chloride of potash, and everything of that sort, the Brin process was one of those beautiful things that only appeared now and then; and they were bound to bow down almost to the genius by which such a thing had been done. The simple fact that air was pumped in and oxygen pumped out, was just one of those wonderful things that only occurred once in a generation. His works were in one of the nicest neighbourhoods of the United Kingdom, surrounded by residential property; and if anything could be done to mitigate the little nuisance (for there was no denying that there was always a little), it would be a blessing; and he felt himself very much inclined to see if he could not adopt this system of purification. It was not for him, after the able discussion they had had, to occupy their time, except to say that, in his long experience in chemical operations, he had never met with anything more beautiful than this process, nor ever met with a man so able to become the exponent of a principle, and carry it out to a successful issue, as their friend Mr. Valon.

Mr. VALON said, with the President's permission, he would answer one question which he had forgotten, and that was as to the effect of oxygen on the illuminating power of gas. There were some very exhaustive experiments made by Dr. Frankland which were published in the *Journal of the Society of Chemical Industry* in the year 1884.* He said: "Mixtures of ethylene and oxygen in insufficient quantity to form explosive mixtures possess a greater illuminating power than pure ethylene; the intrinsic luminosity of the ethylene being greatly increased." Then he said, after giving the details of a number of exhaustive experiments: "From these results, and the curves that are constructed from them, it appears that the addition of the oxygen increases the illuminating power of the ethylene; the highest luminosity observed being in the case of a mixture consisting of 75 per cent. of ethylene and 25 per cent. of oxygen. On increasing the proportion of oxygen beyond this, the illuminating power of the mixture was again diminished."

Mr. HUMPHRYS remarked that those experiments dealt with ethylene, but there were some experiments tried by Mr. B. W. Smith, of Smethwick (which were laid before the Midland Association of Gas Managers about 1885), with oxygen and pure gas, and they showed that a moderate increase of oxygen up to about ½ per cent. did actually increase the illuminating power. That paper was published in the JOURNAL OF GAS LIGHTING in 1885.

Mr. ANDERSON asked if the increased luminosity meant intensity of flame or volume, over 1000 cubic feet of gas.

The PRESIDENT said it referred to intensity of flame.

A HISTORY OF A HEAP OF OXIDE.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

I may at once preface this paper by disclaiming the idea of having any novel or striking points to bring before the meeting, or anything beyond a plain story of gas-works every-day life. In the abstract, it is usually admitted that one of the chief objects in view in the reading and discussion of papers, is that of comparing our experiences; but as a matter of fact, members refrain from doing so, unless they have hit upon some new line, enabling them to set forth results that surpass those hitherto obtained in our ranks. To hear and to tell of some new thing appears to be the chief end in view; and consequently many of our members sit silently in their seats, year after year, simply from an apprehension that their experiences possess no striking hue of novelty. Without detracting in the slightest degree from the importance of a knowledge as to the latest developments in our profession, I cannot but think that it is also desirable for us to possess a more intimate acquaintance with the details of every-day working. In the hope of contributing to a small extent in this direction, I have ventured to trespass on your time with a plain account of a heap of oxide, and the work that it has done in the way of removing sulphuretted hydrogen, at the Salisbury Gas-Works.

The usual way of estimating the work done by purifying materials is to state the quantity of gas purified by them. If the proportion of impurities remaining at the inlet to the purifiers, to be removed from the gas, was a fixed and definite quantity, this plan would be accurate; but such is not the case. As a general rule the whole of the condensing, washing, and scrubbing plant remains in use throughout the year, regardless of the fact that the make of gas during the summer months is only one-third or so of that in the winter. This is exemplified by Diagram No. 1, which shows the range of gas made per diem throughout the year; and the limits are 320,000 cubic feet on the one hand, and 100,000 on the other. Now, the 100,000 cubic feet get as much condensing, washing, and scrubbing as the 320,000. The only difference is that the scrubber pumps are not running so fast in the summer as in the winter. The natural result is that in the winter the impurities pass *further forward* than in the summer; and as regards the particular one under consideration—sulphuretted hydrogen—you will see by Diagram No. 2 that it ranges from 600 grains per 100 cubic feet in the winter, to 440 grains in the summer. The sulphuretted hydrogen line possesses a marked similarity to that of the make of gas, but is also influenced by other causes, atmospheric temperature being an important one. During the winter, and also during the summer, it is fairly constant, but subject to fluctuations during the spring and autumn.

On account of this fluctuation, the quantity of gas purified furnishes only a very approximate estimate of the work done by the material. Just in the winter when conditions are least favourable, it may have 600 grains of sulphuretted hydrogen to deal with; and in the summer, when the make is so much less, only about 70 per cent. of this quantity. An extended series of experiments is therefore necessary before anything like a definite conclusion can be arrived at as to the quantity of sulphuretted hydrogen to be removed in the purifers in the course of a year. Diagram No. 1 is constructed from the results of some 70 different tests, including at least one in each week, taken during the year 1888. From this diagram it appears that the total weight of sulphuretted hydrogen present in the gas, and removed during the year, was 23 tons. This represents in bulk 5,733,500 cubic feet. The quantity of gas made was 69 millions. Therefore the average is 522 grains per 100 cubic feet, or 0·831 per cent. by volume. For full particulars as to the process used in conducting these tests, reference may be made to a series of articles on "Quantitative Purification," which appeared in the JOURNAL OF GAS LIGHTING during the early part of last year.

The heap of oxide which is the subject of our attention, was delivered at the works some 3½ years ago. It consists of a natural clay iron ore, as found on the ground surface at Westbury, Wilts; and is simply prepared by drying and crushing. In this state it is supplied to most of the gas-works in the neighbourhood. It has been my duty on several occasions to analyze samples of this ore; and the composition of this particular sample was accurately ascertained. For the present purpose its composition may be taken as 66 per cent. hydrated peroxide of iron; 28, of earthy matter; and 6, of uncombined water. In accordance with the usual plan of dealing with this kind of oxide, it was prepared after delivery at the gas-works by mixing with about its own bulk of sawdust. The weight of the oxide was 20 tons; and 4 tons weight of sawdust, together with about 15 per cent. of water, were used in preparing the material. Its composition when ready for use was as follows:—

	Cwt.		Per Cent.
Hydrated peroxide of iron	264	..	49
Earthy matter	112	..	21
Organic do.	80	..	15
Water	80	..	15

As compared with the best Irish bog ore, this sample is very rich in iron; but the presence of so large a proportion of earthy matter would be regarded by many as an objection, as likely to cause back pressure. With ordinary care, and purifiers of ample area, no trouble arises from this cause; but when the purifiers are comparatively small, Irish ore is preferable. A box 20 feet square, fully charged, gives about 0·4 inch back pressure. The Westbury is very much cheaper than Irish ore. The cost of the heap ready prepared, as above mentioned, inclusive of sawdust and labour, was not more than 18s. 4d. per ton.

In order to avoid the complication due to the presence of various proportions of moisture in the several samples of this oxide, it was tested for moisture under the conditions usual in testing oxide, by exposure to a temperature not exceeding 200° Fahr., until it ceased to lose weight. The

* See JOURNAL, Vol. XLIV., pp. 17 *et seq.*

DIAGRAM No. 1.

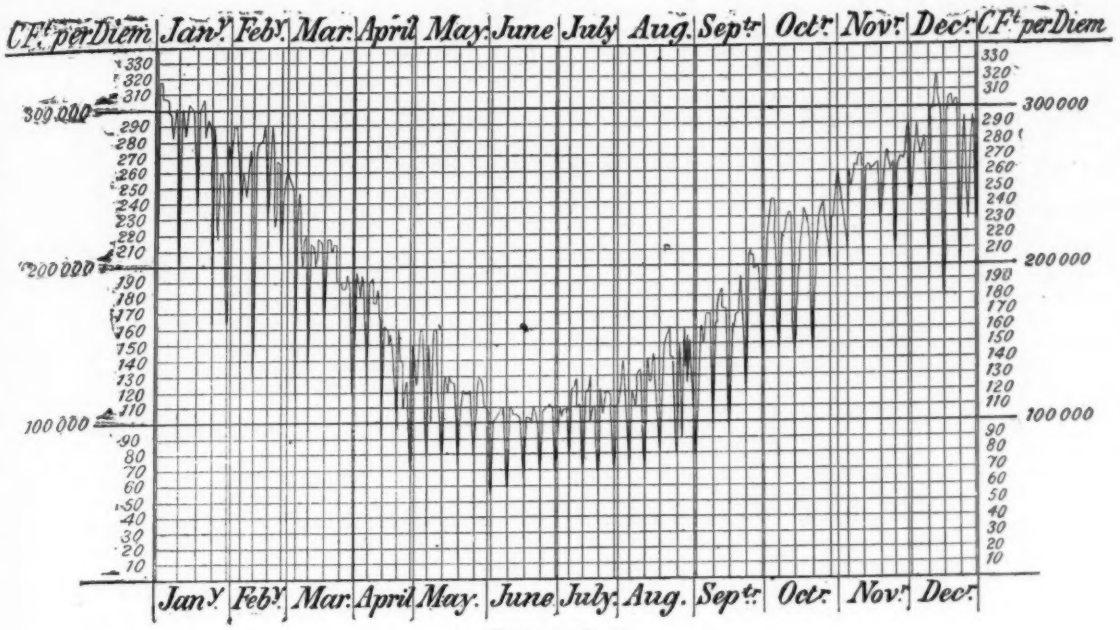

DIAGRAM No. 2.

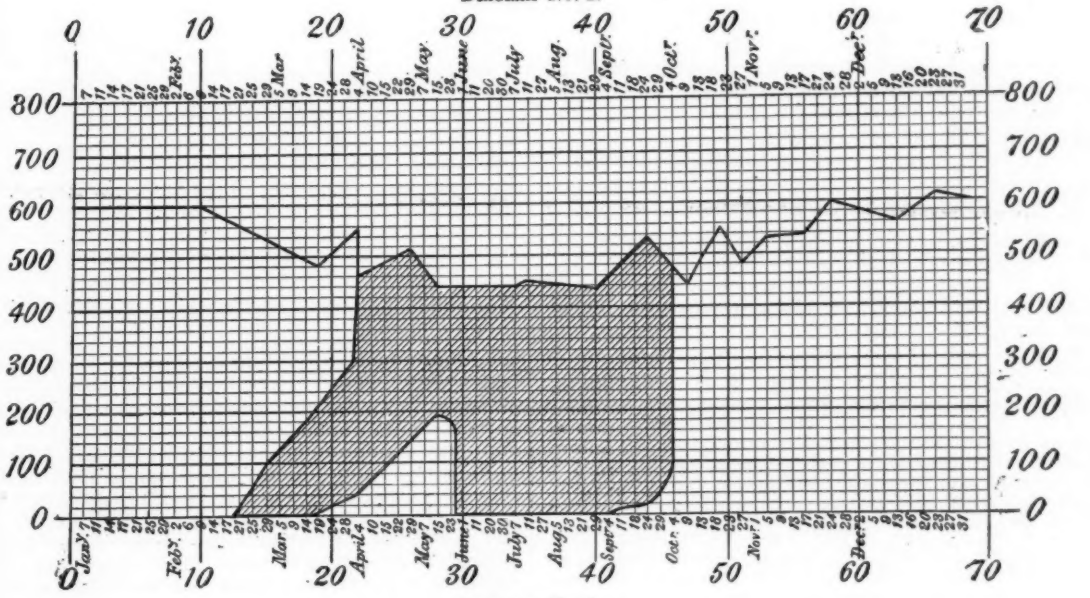

DIAGRAM No. 3.

No. of Exposure.	Cubic Feet of Gas Passed.	Days in Use.	Interval of Rest.	Soluble in CS_2 Per Cent.	Cwt. Oxide.	Cwt. H_2S.	H_2S According to Soluble S.	Total H_2S.
1	8,600,000	58	37	9	420	44½	—	—
2	12,030,000	43	32	16	"	40¾	85¼	—
3	11,550,000	59	79	25	"	63¼	148½	—
4	14,000,000	74	43	33½	"	74½	223	—
5	7,400,000	28	49	34	"	6½	229½	—
6	15,500,000	91	124	38	"	44½	274¼	—
7	11,850,000	53	37	41½	"	42	316½	—
8	7,350,000	28	24	42½	"	12¾	329¼	?
9	32,270,000	224	70	52½	315	122½	369¼	—
10	5,880,000	21	38	54	"	23	382½	—
11	10,350,000	49	"	56	"	33	415½	432
—	136,780,000	728	—	—	—	—	—	—

sawdust used was found to contain 45 per cent. of water. By this means a "dry basis" was arrived at, for use in the calculations based on the sulphur test. On this dry basis the material weighed 21 tons, as follows :—

	Cwt.		Per Cent.
Hydrated peroxide of iron	264	..	63
Earthy matter	112	..	26½
Organic do.	44	..	10½
	420		

Considerable disadvantage was caused by the fact that it was not practicable to commence *ne novo* with an entirely new stock of oxide. This heap was used in conjunction with three others, two of which were nearly spent; and it was thereby placed in the position of being yoked in as one of a lame team, and forced to do more than a fair share of the work. Indeed, it was unfairly prejudiced by the endeavour to get as much work out of the old stuff as possible before rejecting it. The purifiers in which the oxide is used are 20 feet square, and two in number. There are also four purifiers, each 12 feet square. The two large boxes are used for oxide; two or three of the others are charged with lime; and the remainder used as check purifiers and filled

with oxide. The arrangement of valves permits either the two 20 feet or the four 12 feet to be used first; but our usual way of working is to apply the 20 feet first, so that they practically take out all the sulphuretted hydrogen. They are worked together, until a foul test shows on the outlet of the second. The first is then changed; the check purifier being meanwhile depended upon to take out the small proportion of sulphuretted hydrogen that passes the large purifier. As the make of gas varies from 100,000 up to over 300,000 cubic feet per diem, the horizontal area of purifying surface ranges from 4 to 1·3 square feet of surface or horizontal area per 1000 cubic feet of gas.

Diagram No. 3 shows the actual work done by this oxide. It was hoped that by starting with a rather small allowance, as compared with the size of the purifier, the whole heap might be maintained in operation together until quite spent; but at the conclusion of the eighth exposure, it had increased in bulk so much that this could not be carried out. One-fourth of the whole was therefore removed, in order that no further alteration need be made. During the first four exposures the material acted well, doing more than its fair share of the work; but at the fifth exposure we came to grief. In accordance with a suggestion made to the writer, it was put in the purifier in one thick layer, instead of in two, which is the regular custom. The result was that the purifier had to be turned off on account of back pressure before it had got well into work. The disproportionately small percentage of sulphuretted hydrogen removed in this experiment may perhaps attract attention. A consideration of the method of working, as above stated, furnishes the explanation. Since the purifier, for some time after being started, forms the second in the series, the first box was doing the greater part of the work. After this a fair start was secured in the sixth exposure; but a little falling off showed itself in the seventh; and the eighth was brought to an abrupt conclusion on account of back pressure. The cause of this has been already pointed out.

We now come to the ninth exposure, which is interesting as showing the advantage of admitting a very small percentage of air at the inlet of the exhauster. At the commencement of this exposure, the use of air was very cautiously began. After a time sulphuretted hydrogen made its appearance at the outlet, as shown on the diagram, and the air supply was gradually increased until this disappeared. A little under 1·5 per cent. was necessary to secure this result. It was admitted through a 30-light wet meter at the inlet to the exhauster, which was run at 8-10ths vacuum. This was sufficient to draw air through the meter. The actual quantity of sulphuretted hydrogen was about 0·7 per cent.; and since one-half its volume of oxygen is needed to secure complete revivification, it follows that the proportion of air shown by theory to be needed is 1·75 per cent. The difference between this and the quantity actually admitted was probably furnished by the small quantity of oxygen that is always present in the gas from various causes. However this may be, sulphuretted hydrogen did not again appear until the make, and also the proportion of impurity to be dealt with, had increased so much as to reduce the proportion of air to 1 per cent. The meter and connection were then being worked to their full capacity, and therefore more air could not be admitted. As soon as the sulphuretted hydrogen showed a determination to increase, it was considered advisable to close this experiment, which was done after the box had been 224 days in use, removing all the sulphuretted hydrogen during the greater part of the time. A graphic representation of this exposure is shown by the shaded part on diagram No. 2.

The tenth exposure was a short one; but this was no fault of the material. The oxide in the other box failed on account of being saturated with sulphur. In both the tenth and eleventh exposures the admission of air was continued to the extent of 1 per cent. or less, but did not appear to be of much use. I do not think that the oxide is failing, because other heaps of similar material have been worked up to 63 per cent. of sulphur, but am rather inclined to ascribe it to the fact that the material came out after the long exposure, quite its natural colour, and very dry, containing only about 5 per cent. of water. From this I conclude that the material had become warm while in use. It was wanted again after 40 days, and did not receive a fair share of turning and watering. Now that the summer has come, we are able to give it a long rest, and also extra attention, so that the next exposure will reveal the true cause.

Attention may now be directed to a singular point in connection with the ninth exposure. Looking at the working during the previous exposures, and taking all the circumstances into consideration, the quantity of sulphuretted hydrogen removed, as calculated from the results of the bisulphide of carbon test, appears to be satisfactory; but in the ninth exposure there is a deficiency between the results of the bisulphide test, and those computed from the diagram. The former shows 122½ cwt. of sulphuretted hydrogen, and the latter about 140 cwt. On examining the residue after treatment with bisulphide, it was found that a considerable proportion of sulphur remained in an insoluble form; and this sulphur came in the first place from the sulphuretted hydrogen in the gas. So it is evident that in this case the bisulphide test failed to indicate the whole of the sulphur present. A sample of the material was thoroughly washed with bisulphide of carbon, until the liquid ran off perfectly colourless, and left no residue on evaporation. One portion of this sample was thoroughly oxidized, and another was fused with bicarbonate of soda—the sulphuric acid being precipitated in each case as sulphate of barium. By this means it was ascertained that, in addition to the sulphur soluble in bisulphide of carbon, some 16½ cwt. was present in the heap in an insolnble form. I do not propose to attempt any explanation of the way in which this insoluble sulphur is combined; but should be glad to hear whether similar results have been observed in other cases with oxide that has been revivified *in situ*.

On comparing the practical results shown in Diagram No. 3 with those indicated by chemical theory, it appears that a large proportion of the hydrated peroxide of iron is inactive, or for some reason or other does not come into operation. It is generally accepted that one equivalent of hydrated peroxide enters into combination with three of sulphuretted hydrogen. Assuming this to be correct, this heap of material should absorb 126 cwt. of sulphuretted hydrogen before it is completely saturated. In no case was this result obtained without the use of air. Leaving out No. 9, the highest result is No. 4, where nearly 60 per cent. of the theoretical duty was obtained. In other cases only about 33 per cent. was realized. Considering that even when oxygen is not designedly admitted, there will always be a certain amount of revivification *in situ* going on, a nearer approach to theory might be expected. But it is important to remember that in ordinary working the purifier does not remain in use till it is saturated and will not do any more work. The time for turning off is ascertained, not by testing the gas at the inlet and outlet respectively, to see if any important proportion of the sulphuretted hydrogen is still being removed, but by the fact that the next box shows a foul test. This usually obtains when the first box is still doing the greater part of the work, and removing more than 300 grains of sulphuretted hydrogen per 100 cubic feet. So the oxide is under very different circumstances from those of a laboratory experiment, where an excess of sulphuretted hydrogen is passed through it until no more is taken up. It is also to be expected that the results, with such very dilute mixtures of sulphuretted hydrogen as those which obtain with foul gas, would be different from those that take place when pure sulphuretted hydrogen is used. In the second purifier the oxide has to deal with not more than 1 or 2 parts per 1000 of sulphuretted hydrogen. The tests obtained at the outlet of the first purifier furnish an important indication of the value of the material to the gas maker, who requires an oxide that will not only deal actively with the comparatively large proportion of sulphuretted hydrogen in the first purifier, but be equally energetic in removing the tailings in the second.

The history of this heap of oxide is not yet closed. At present it is undergoing a long rest, as the purification is being conducted with some newer oxide and the use of air, and I do not expect to change another purifier before October. There is no reason why as much should not be done with it as with other cargoes of similar material. In that case it will serve for about five more exposures, or a less number if air or oxygen is used, and will gain up to 63 per cent. of sulphur. I may mention that in the last lot of new oxide received, the proportion of sawdust is increased twofold, and so far as can be seen, with satisfactory results. The proportion of pure oxide in the heap under consideration greatly exceeds that present in Irish bog ore; so the Westbury oxide might be diluted to a much greater extent, without being rendered poor in iron. This suggests whether it might not be possible to hit upon a material more suitable than sawdust, for diluting the oxide. Even the hardest sawdust seems to soften and rot under the influence of repeated

exposures and revivifications, and the buyers of spent object to a large proportion of sawdust as likely to injure the colour of the acid. We want something as light and porous as sawdust, but tougher and more of a fibrous nature.

Discussion.

Mr. W. A. VALON (Ramsgate) asked if the figures had been correctly stated in the paper, as the total made 69 millions, and the sulphuretted hydrogen 5 millions and odd.

Mr. HUMPHRYS said there was a "0" too many; it should be 578,550 cubic feet.

Mr. VALON also pointed out that Mr. Humphrys admitted that the large area on which he was obliged to rely with this limited use of air was two-and-a-half times as much as he (Mr. Valon) used at Ramsgate.

Mr. ANDERSON said he understood that the quantity of oxide used was 28 tons in a purifier 20 feet square. How deep, he asked, was the oxide put in the purifier?

Mr. HUMPHRYS said it was about 3 feet—one layer of 1 foot and another of 2 feet.

Mr. H. ASHTON HILL (Wallasey) asked if it were necessary to mix sawdust with the oxide, as he used it without any. In reply to a question, as to what kind of oxide he used, Mr. Hill said it was Irish oxide.

The PRESIDENT pointed out that the oxide used by Mr. Humphrys was of a totally different character—obtained in Wiltshire.

Mr. C. S. ELLERY (Bath) said one important point was raised in the paper; and that was with regard to testing the oxide for sulphur. He had spoken of the sulphur which was soluble in bisulphide of carbon, and then found a further quantity in it afterwards; and it would be very important to determine how long the oxide should be soaking (so to speak) in this bisulphide before all the sulphur was taken out. He had repeatedly found that, although they might one day abstract all the sulphur apparently in the sample, yet if the same sample were tested again the following day, they could get a further quantity of sulphur from it. Where there were discrepancies between the tests of buyers and sellers, he sometimes felt inclined to put it down to the fact that they had too hastily tested the sample. It seemed to require to be treated with disulphide of carbon at repeated and considerable intervals if all the sulphur was to be dissolved out.

Dr. THORNE thought the most probable explanation of the difficulty in making the estimations of sulphur in spent oxide was that, before the sulphur tests had been made, a process of revivification had been going on, but had not been completed. They knew that in the oxide of iron purification revivification was necessary. The sulphuretted hydrogen was not extracted at the moment as free sulphur, but formed sulphide of iron; and it was only the decomposition of the sulphide by the air in the process of revivification that precipitated, so to speak, the sulphur in the free state, and brought back the iron to the oxide state ready for taking up more sulphur. When the oxide was taken out and tested, care was not always exercised to revivify it completely, and so precipitate the whole of the sulphur before the test was made. When the bisulphide test was used, the free sulphur was extracted; but that still present as sulphide was left. If that were exposed to the air till the next day, for instance, a good deal more became revivified, and fresh sulphur was precipitated; and this could be again taken up by the carbon disulphide. If this test were to give a satisfactory result, care must be taken to thoroughly aërate the oxide before testing. He might also call attention to the relative areas used in the purification now described, as compared with those given by Mr. Valon that morning. Mr. Humphrys spoke of a maximum make of gas of 300,000 cubic feet, and a minimum of 100,000 cubic feet; and for that quantity, his purifying area was about 1376 square feet. On the other hand, Mr. Valon was using 586 square feet area, with an output of just about double Mr. Humphrys', or about 250,000 cubic feet in summer and 600,000 cubic feet in winter. So that he was getting the same purification for double the quantity of gas with less than half the area of purifying space.

Mr. HUMPHRYS, in reply, thanked Mr. Valon for drawing attention to the clerical error in the paper whereby the sulphuretted hydrogen was multiplied ten times. With regard to the question of the large area, he was certainly fortunate in being in possession of large purifiers. He at once admitted, with the greatest frankness, that if he had not such large purifiers he should not try Westbury oxide for purification; the Westbury was an inferior material containing some 25 per cent. of sandy clay, and he should not care to try it with much smaller purifiers. As to the whole of the sulphur being taken out, he was quite alive to the necessity of getting the material thoroughly revivified, as mentioned by Dr. Thorne, before applying the bisulphide to it; and by taking care to get out as much as he could, it was his practice to run the disulphide through until it was quite colourless, and not only so, but until it left no evaporation on a slip of glass.

The PRESIDENT said he had been a great advocate for thick layers of oxide. He had four purifiers, each of which contained oxide 4 ft. 6 in. deep, in one solid mass. But his purifying area was good; he had two purifiers 25 feet by 40 feet, and others 12 feet square. He had one which had been running now for 14 months; and he had sometimes run them for 18 or 19 months. He also knew one at Ventnor which had been running for this latter length of time. If they were able to give a thorough good washing and scrubbing beforehand, they would find that, after running some 18 months, they got no great amount of increase of pressure. He sometimes ran his six purifiers altogether, lime and oxide, at so small a pressure that he should hardly like to mention it. He had only sold one lot of oxide in ten years; and his oxide, which came from the Gas Purification Company, revivified now as well as ever.

Technical Record.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

THE ANNUAL CONGRESS.

The Sixteenth Annual Congress of the above Society was held in the Gas Pavilion at the Universal Exhibition in Paris from the 11th to the 14th of June, under the presidency of M. Cornuault. The arrangements, as set forth in the programme issued by the Committee, were summarized in the JOURNAL for the 11th ult.; and the proceedings at the meeting were noticed in our editorial columns in the succeeding issue. The following particulars as to the business transacted are translated from the report which appears in the current number of the *Journal des Usines à Gaz*, the official organ of the Society.

At the opening of the proceedings on the morning of the 11th, 280 members were present, as compared with 126 at the congress last year at Boulogne. The first business was the reading of the official report of the proceedings on that occasion, which was formally adopted. The names of the new members proposed for election—45 in all—were next submitted, and approved; the President of The Gas Institute (Mr. G. Garnett, M. Inst. C.E.) being, as usual, admitted an honorary member. The report of the Committee on the general progress of the Society during the year was then read by the President. The greater portion of it was devoted to notices of the various members who had been called away since the previous congress—unfortunately, a rather long list, in which figured the name of Mr. R. P. Spice. In addition to these losses, six gentlemen had withdrawn from the Society; being no longer connected with the gas industry. The roll was thus reduced from 553 to 533 members; but with the new-comers the total was brought up to 577—consisting of 19 honorary and 480 ordinary members, and 78 associates—as compared with 84 at the formation of the Society. The Committee look forward with the greatest confidence to making the total 600 at the meeting next year. Particulars were also given of the contributions to the funds of the Society by various gas companies, amounting to 21,125 frs. (£845). The Treasurer (M. Deleury) then presented a report on the financial position of the Association. It showed that at the close of the past year there was a balance to the good, with the cash in hand, of 13,589 frs. (£543); and that the capital had risen from 90,483 frs. (£3619) to 100,872 frs. (£4034)—an increase of 10,389 frs. (£415). The next business was the election of members of the Committee to replace those retiring by rotation, but eligible to serve again. The ballot resulted in the re-election of MM. Deleury, Monnier, and De Marisy, and the choice of M. Visinet to serve with them for a period of three years. This completed the general business at the morning sitting. Subsequently the Committee held a meeting for the election of officers for the current year, with the following result:—*President*, M. Le Treust; *Vice-President*, M. Salanson; *Secretaries*, MM. Melon and Visinet; *Treasurer*, M. Deleury.

On the reassembling of the members in the afternoon, the President delivered his Inaugural Address, of which the following is an abstract translation:—

M. Cornuault commenced by remarking that the congress of the Society had opened in the midst of the exceptional solemnity of a Universal Exhibition of unique splendour; and that probably the first thought that would arise in the minds of the members of the Society would be in connection with the progress made by the gas industry in the period which has elapsed since the preceding exhibition, in 1878—a period disturbed by a multiplicity of

causes, and specially marked by the birth and development of a new competing industry almost unknown up to that date. At the time of the exhibition of 1878, an attempt was made by the able reporter of the jury to estimate the progress of the gas industry in the years immediately preceding that exhibition; and he ascertained that while in 1872 there were in France only 550 towns lighted by gas—the population of 8,757,600 persons consuming altogether 262 million cubic metres (about 9249 million cubic feet) of gas—the number of towns lighted in 1878 had increased to 687, with a total population of 9,943,400 inhabitants, consuming 382 million cubic metres (13,484 million cubic feet); the latter figure corresponding, taking into account the loss by leakage, to a production of about 430 million cubic metres, or nearly 15,180 million cubic feet of gas. This was an increase, in six years, of 137, or 25 per cent., in the number of towns; of 1,185,800, or 13·5 per cent., in the number of inhabitants consuming gas; and of 120 million cubic metres, or 31·4 per cent., in the quantity of gas burnt. Looking at the eleven years preceding the present exhibition, the question of special interest to gas managers was, Has this onward movement been arrested? On this matter he would give the members some statistics in regard to the total production of gas in France in the decennial period 1878-88, and leave the figures to speak for themselves. They were as follows:—In 1878, 430,700,000 cubic metres; in 1879, 467,500,000 cubic metres; in 1880, 507,800,000 cubic metres; in 1881, 536,200,000 cubic metres; in 1882, 560,000,000 cubic metres; in 1883, 575,000,000 cubic metres; in 1884, 576,700,000 cubic metres; in 1885, 589,100,000 cubic metres; in 1886, 600,700,000 cubic metres; in 1887, 610,000,000 cubic metres; in 1888, 628,000,000 cubic metres. The figures for the two last-named years were only approximate. These statistics were, he thought, sufficient to show that the progress of the gas industry had been constant during the period covered by them—that nothing had arisen to check it, but rather to the contrary. Turning to the number of towns lighted, from 687 in 1878 they had risen to 914 in 1883, and to 1001 in 1888; while the number of the population consuming gas had increased from 9,943,400 in 1878 to 11,840,000 in 1883, and to 12,680,000 in 1888. So that since the previous exhibition was held there had been a gain of 314 towns, or 45 per cent.; of 2,736,600 inhabitants supplied by gas, or 27·5 per cent.; and about 200 million cubic metres of gas consumed, or 46·5 per cent. These, he went on to remark, were eloquent figures; and they testified in a high degree to the upward progress of the gas industry, which he thought his hearers might well believe was far from having reached its utmost limit. Hardly one-third of the entire French population is at present lighted by gas; and, inasmuch as, out of the 36,121 communes in France, comprising 38,198,000 inhabitants, 33,372 of them have populations of less than 2000, and necessarily very scattered, with a total of 20,161,000 inhabitants, the suppliers of gas have still good reason for counting upon a development of the consumption of gas per head in the towns which have populations of some importance. It is in these towns that the increased consumption which has been witnessed in the past few years has taken place; it is there that it will be repeated in the years to come, and notably in industrial centres. Taking the case of Paris, the President showed that, in the census years 1872, 1876, 1881, and 1886, the consumption per head was respectively, 67·79, 79·91, 99·11, and 107·20 cubic metres. At the present time it is certainly upwards of 115 cubic metres (4060 cubic feet); but it is far from having reached the highest point—being still below the figure of the large towns in England. Similar statistics might be cited for other towns in France; and the same conclusion would be arrived at.

The President next passed on to refer to the measures which have of late years been adopted by suppliers of gas—impelled by the actual or possible competition of petroleum and electricity—to render themselves of greater service to the existing consumers by bringing under their notice the best appliances suited to their varied requirements, and to draw fresh customers by constant solicitation. He alluded to the minimizing or the total abolition of the cost of fitting up the gas in the houses of new consumers, to the gratuitous loan of cooking and heating stoves, to the reduction of price beyond a certain consumption, and to the offering of special advantages to users of gas for motive power, as important steps in the direction of stimulating and increasing business. He insisted particularly on the necessity for the engineers and managers—in fact, the staff generally—of gas undertakings to turn their attention more to that branch of the business of gas supply which lies beyond the limits of the works. He considered that, speaking generally, science and experience had done almost all they are capable of accomplishing as far as the delivery of the gas at the house of the consumer is concerned. But was it, he asked, the same inside the house? Had the questions of the choice of burners, their construction and location, the provision of suitable channels for carrying off the products of combustion—in a word, of consuming the gas under the best possible conditions—been studied by the gas engineer in association with the architect or builder? To cite only one example, had they sufficiently utilized the motive power developed by the upward current of gas as a simple and convenient ventilating agent? He thought he could answer boldly that they had not. In his opinion, the purview of the engineer should extend from the production of the gas to the point of its consumption. This, he said, was the custom with those who are engaged in electric lighting, who bestow as much care and attention on the filament of the incandescent or the regulator of the arc lamp, as they do on the fitting up of the dynamo. This was a truth which he commended to his colleagues' attention.

This reference to electric lighting naturally led the President to deal further with the subject, which, as he remarked, seems now to be an almost indispensable feature in the presidential address of a gas engineer. He did so, not for the purpose of advising his colleagues to abandon the gas industry in order to take up the supply of the newer illuminant, but to put before them the question whether gas companies ought to systematically refuse to undertake electric lighting. His idea was that they should not. At the same time they ought not to rush blindly into the business; but go carefully—studying the matter, doing a little, putting themselves in a position to do more, and waiting their opportunity. They should, however, give the first consideration to gas, and spare no pains to extend its use. He indicated the differences in the conditions under which gas undertakings are conducted in France as compared with England, and remarked that the system of limited concessions enables municipal authorities in the former country to impose upon gas companies a new mode of lighting, or even to set against them a supplier of a competitive method of lighting. He thought that in such circumstances gas companies could very conveniently undertake the supply of electric light, with every prospect of ensuring the regularity of the dual service. No difficulty would, he said, be experienced in obtaining and working the plant; while the ordinary office and outdoor staff of the company would be able, without entailing much additional expense, to discharge the extra duties required of them. In every way, therefore, gas companies were in the best position for satisfactorily supplying the electric light. But it was for precisely this reason that they should undertake the business seriously—that was to say, at remunerative prices and on reasonable conditions. Gas companies were frequently threatened with competition from a central electric lighting station—generally in order to force a reduction in the price of gas. Let the gas companies, if they wished to hasten the destruction of their ephemeral rival, start a few electric lighting stations of their own, working the plant with gas engines.

M. Cornuault concluded his address by referring to the position occupied by gas at the Paris Exhibition, to the display in the Gas Pavilion, and to the labours of M. Albert Ellissen and the Organizing Committee in carrying out all the arrangements in connection therewith. The gas industry, he said, was not one that was going to strike its flag before new-comers; on the contrary, it bore that flag bravely at the exhibition, in which gas occupied a very important place. They ought to be highly proud of the display there made, and prosecute their investigations with the fullest confidence in the future of their vivacious industry.

After the delivery of the President's address, reports were presented on the subject of the prizes offered by the Society. It was tated that two *mémoires* had been submitted in competition for premiums. One of them was "A Study on the Radiation of Heat, considered in its Applications to Lighting and Heating;" the other, on the subject of "Ventilation by Gas." Short summaries were given of these papers, both of which the Committee considered were interesting and remarkable from different points of view—one dealing with a still uninvestigated problem in physics; and the other furnishing a quantity of material to the monography of ventilation. They considered that both the questions suggested to intending competitors by the Committee had been advanced by the papers presented, which were of equal importance as far as the special subject treated by each was concerned, although they did not entirely fulfil all the specified requirements. The Committee thought that the authors of works of the extent and character of those sent in should be well recompensed for their labours; and therefore they had decided to award a premium of 1000 frs. for each paper. The writer of the first-named *mémoire* was M. Guéguen, Editor of the *Journal de l'Eclairage au Gaz*, and author of the papers on the "Chemical Theory of the Production of Illuminating Gas" which gained the Society's prizes in 1883 and 1884, and of which translations appeared in the JOURNAL in 1884 and 1885; the other being the joint production of MM. Coindet and Marchal.

The next business was the award of premiums for the best papers presented at last year's congress. They fell to M. Melon, for his paper "On the Most Practical Method of Developing the Consumption of Gas;" to M. De Lachomette, for his description of "A New Process for the Manufacture of Sulphate of Ammonia;" and to M. Schauffler, for his communication on "The Use of Palladium-Gold for the Detection of Leakages."

Prizes were also bestowed on twenty aged and meritorious workmen out of the forty-three applicants, of whom eighteen came forward for the first time. In view of the fact of the holding of the exhibition this year, and of the exceptional manifestation on the part of several French gas companies, the Committee decided to enlarge the scope of their rewards for long and efficient service, by inviting to participate therein candidates whom it had not been possible to recompense hitherto, notwithstanding their merits. The Committee therefore increased the number of prizes from twelve to twenty. The ages of the selected candidates ranged from 55 to 74 years, and their period of service in connection with gas-works from 26 to 43 years.

The subjects of the papers presented at the meeting were given in the JOURNAL for the 11th ult. The communications themselves will be dealt with, as occasion may serve, in subsequent issues.

WESTERN (U.S.A.) GAS ASSOCIATION.

To-day we give the second instalment of our abstract of the Official Report of the proceedings at the recent annual meeting of this Association, commenced in the JOURNAL for the 18th ult.

Mr. C. R. FABEN, Jun., of Toledo, Ohio, read a paper on "Fuel Gas." He defined this as the result of the partial combustion of some natural fuel. Whether coal, water, or producer gas was used, heat was necessary for its production; and this was provided by the combustion or the partial combustion of the material used. Coal gas was too costly; water gas not suitable in other ways; and producer gas too poor. So it appeared that a commercial fuel gas must necessarily consist of a mixture either of all or of any two of these. He did not consider the proposition to convert all the solid fuel required in a town into gaseous fuel, as laid down by enthusiasts, to be at all practicable. After tracing the historical progress of fuel gas, including the discoveries of the Messrs. Siemens, he said that natural gas was mainly responsible for creating the modern demand for fuel gas. So many conflicting statements had been made on the subject that it was difficult to prove which was right. The relative value of combustible gases had been stated as follows:—Natural gas, 100; coal gas, 65; water gas, 29; and producer gas, 13. Accepting the data proved in the natural-gas districts, that to do the work of one ton of coal, 15,000 cubic feet of natural gas for manufacturing, or 20,000 cubic feet for domestic use would be needed, it would follow that water and producer gas must be sold at an absurdly low price to compete with coal. Water gas at 5d. per 1000 cubic feet would be equivalent to coal at 28s. per ton. Then fuel gas enthusiasts had claimed that by the medium of gasification, 40 to 45 per cent. of the total theoretical efficiency of the coal could be obtained; but according to his information, this was too much. A Siemens regenerator furnace, working under favourable circumstances, would only realize 27½ to 32 per cent. of the theoretical duty. A fuel gas company would have to contend with very wide variations in demand. His idea was that the best kind of fuel gas to supply would be an article equal, if not superior to coal gas in respect to heating value. A highly carburetted water gas would furnish this. At present the idea of a distinct fuel gas undertaking was absurd, though business policy might dictate to existing coal gas companies the desirability of quoting special rates for power and fuel purposes.

In the discussion which followed the reading of this paper, Mr. King said that he was now less enthusiastic on the subject of fuel gas than he was a year ago. Taking published figures, he could not see that it would be practicable to manufacture and sell even the commonest kind of fuel gas at less than 1s. 3d. per 1000 cubic feet; and, as Mr. Faben had shown, even at this low rate it would be three or four times more costly than coal. Mr. Egner said that there was a very large margin for improvement in the amount of light obtained through the medium of coal gas. A given weight of coal would yield one hundred times as much light by the arc, and twelve times as much by the incandescent electric light, as it would when used for gas making. Mr. G. Shepard Page gave an account of his observations of incandescent gas-burners; describing the Lewis-Sellon, the magnesia comb, the Lowe, and the Welsbach. All these were either too costly or required too much care to be a real practical success. It was remarkable that the regenerative burner which was introduced at about the same time as the incandescent, had proved so much more successful in every way. As to fuel gas, he did not think the time was come when it could be successfully put on the market; but gas companies were steadily reducing their prices, and he looked to that as the direction in which fuel gas would come into use. Mr. Cowdery said that the first thing to know was the price that the consumer could afford and would be willing to pay for fuel gas. He had heard 3½d. per 1000 cubic feet mentioned as the cost of distribution, and thought that if a regular demand throughout the 24 hours could be relied on, this might be correct. Mr. Somerville said he had observed that when natural gas was distributed for use as fuel the demand during cold weather was very large indeed; from which he gathered that a fuel gas plant would have to be very extensive in order to meet the maximum demands on it. The Welsbach burner answered very well with natural gas; but the mantles wanted renewing every two or three weeks. Mr. M'Millin believed that fuel gas was a possible thing; and that nothing had been advanced in the paper to the contrary. He did not advocate any particular kind of gas, one sort would be cheaper in one locality and another sort in another. He thought it could be proved by figures that fuel gas could be distributed for 3½d. per 1000 cubic feet. The mains would be in active use for a larger number of hours out of the 24 than they are with illuminating gas; and there would be a corresponding reduction in leakage. The cost of distribution per 1000 cubic feet of gas sold was known to be much less in winter than in summer; and the fact was that if the consumption was doubled on the same system of pipes, the cost of distribution was reduced one-half. He thought that when natural gas failed, a large demand for fuel gas would arise, if the gas companies would meet it.

Mr. R. D. WALSH, of St. Louis, Mo., next read a paper on "Inclined Retorts," consisting of a descripton of the system introduced by M. Coze, of Rheims.* The retorts are set at an angle of 30° to the horizontal, and are charged from above by means of hoppers mounted on wheels, travelling on rails laid on the top of the stack. The angle of incline was fixed at 30°, because in that position a charge of coal, thrown in from the top, did not accumulate towards the bottom of the retort, but disposed itself equally. Mr. Walsh proceeded to give particulars of the working of a bench of five retorts set on this principle, as erected at the St. Louis Gas-Works. The retorts were 15 in. × 23 in. × 11½ ft. long; and each retort would efficiently carbonize a charge of 500 lbs. of coal in 4¾ hours. Since the charge was introduced into the retort by gravity, no loss of time or gas took place. In drawing the retort, the lower lid was opened, the charge loosened by means of an iron rod, and it then rolled out of itself. The advantages claimed after a year's use of the system, were a considerable saving in wear and tear, economy of labour, ease of operation, better yield per ton, and economy of fuel. The setting above named required 28 lbs. of coke per 100 lbs. of coal carbonized. Mr. Arndt, of Chicago, was about to adapt the setting to a bed of sevens, in connection with a regenerative furnace, anticipating that a production of 100,000 cubic feet per 24 hours might be thus obtained.

At the close of the paper, a short conversation about the experiment at St. Louis took place. Several of the members had visited the works and seen the retorts in operation; and all appeared to be favourably impressed with the system. Mr. Lansden pointed out that the retorts might safely be calculated to last longer, since the time they were left open was much shorter than under the usual plan, and a rake was never run into them.

A paper on "Retort Furnaces for Burning Coal" was read by Mr. R. M. MITCHELL, of St. Joseph, Mo. This gentleman being so fortunate as to have a demand for all his coke at 4½d. per bushel, whereas he could buy coal at 8s. 9d. per ton, substituted coal for coke in his retort furnaces, which were arranged on the half regenerator plan. The incoming secondary air supply was heated by means of a number of cast-iron tubes, each 11 inches long and 3½ inches bore, projecting right through the air channel. The products of combustion passed through them on the way to the chimney; and the air coming in contact with their exterior took up the heat. So there was no passing backwards and forwards with the waste gases. The front wall of the furnace sloped at an angle of 45° from the shoot to within 5 inches of the ash-pan; and was stepped all the way, so as to take the weight of the fuel off the grate. A charge of coal was always kept on the upper part, and every 1½ hours this was pushed forward into the furnace and replaced by a fresh charge. The clinkering was done every 12 hours. Nut coal might be used, but lump coal was the material at present. Each furnace used 2200 lbs. per 24 hours, and carbonized 9600 lbs. of coal. Coke might be used in these furnaces, and 60 bushels of it would be needed to do similar work. Weight for weight, the coal and coke was about the same; so it was merely a question of money value. He also had a furnace for using nut coal designed by Mr. Arndt, of Chicago, in which the gases instead of passing direct to the setting, were first caused to pass through, or in contact with red-hot coke, to prevent smoke. These used 3800 lbs. of nut coal, and carbonized 10,800 lbs. of coal per 24 hours. Pea coal might be used in these furnaces; and he was also trying a modification that would admit the use of slack. The lump coal worked out to 23 per cent. of the quantity carbonized, and the small coal to 35. There was some accumulation of soot in the flues; and he took off the sight boxes once a week and fired a gun into them. This method kept them perfectly clear.

* See JOURNAL, Vol. XLVI., p. 198; Vol. XLVIII., p. 189.

DOUGALL AND CUTLER'S PATENT FURNACE FRAME.—Attention has lately been called to a novel furnace frame, the joint production of Mr. A. Dougall, of Tunbridge Wells, and Mr. Samuel Cutler, of Millwall. It is claimed for the invention that it effects a considerable saving in fuel, by reason of the more complete combustion obtained by heating the air before it passes into the furnace, while the current of air passing continuously through the heating chamber cast on the frame prevents excessive heat, and reduces wear and tear of the ironwork. To obtain the best results, it is found that accurately-fitting doors are a *sine quâ non*; and in this detail a departure is made from the ordinary practice by dispensing with hinges altogether, their purpose being better served by the special devices shown in the illustration in the advertisement which appeared in the JOURNAL last week. In connection with this matter, we may point out that in the descriptive lines in the advertisement above alluded to the word "lightness" was printed instead of "tightness" in reference to the doors of the furnace.

SOCIETY OF ENGINEERS.—Last Thursday, the members of this Society paid a visit to the works of the East London Water-Works Company at Lea Bridge, Walthamstow, and Waltham Abbey. The party—amongst whom were Mr. J. R. Baillie (President), Mr. H. Adams and Mr. R. W. Peregrine Birch (Vice-Presidents), Messrs. Jabez Church, C. Gandon, Arthur Rigg, Professor Henry Robinson, and A. T. Walmisley (Past-Presidents), and Mr. G. A. Pryce Cuxson (Secretary)—were received and entertained at luncheon by the Company's Engineer (Mr. W. B. Bryan, M. Inst. C.E.), who conducted the visitors over the works, and gave some interesting particulars as to the origin and growth of the undertaking and the extent of its pumping and storeage capacity. Some of these we hope to reproduce next week. The members and their friends were much gratified with what they saw; and at the close of the visit testified their appreciation of Mr. Bryan's courtesy and hospitality. In the evening a number of the members of the Society dined at the Holborn Restaurant, when the President occupied the chair, and the Honorary Secretary and Treasurer (Mr. Alfred Williams) the vice-chair.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE GAS CONSUMERS OF MANCHESTER.

SIR,—I have been trying hard to discover some satisfactory reason why a citizen, being a gas consumer, should be mulcted in a yearly sum by way of rates, in excess of other ratepayers who are not gas consumers; but turn it and twist it in every possible way, I am unable to find any reasonable pretext for such a proceeding. On the contrary, I see several good and substantial reasons why the gas consumer, instead of being made the milch cow of the Corporation, should, if there is to be favouritism at all, have a degree of favour bestowed upon him. Assume, for example, that he employs a gas-engine on his premises, and that he has a cooking-range in his kitchen. To the extent that he makes use of these, he is a public benefactor, as compared with his neighbour who prefers to use a steam-boiler and engine to obtain his motive power, and a coal fire to cook his sirloin. The latter vents his black smoke into the atmosphere; whilst the former is blameless in this respect. And yet the wise men of Gotham who compose the majority in the City Council, sit round a table in the Town Hall, and gravely decide that the man who thus consumes gas and lives cleanly, should help to purchase coals for the other, who defiles the atmosphere of the city and is a nuisance to his neighbours. That is in effect what the policy of the majority would amount to, if it could be shown that the appropriation of the big balances of gas profits tended to reduce the rates, which, however, any thinking person can see is a myth.

There can be little doubt that fully three-fourths of the twenty-nine composing the majority of the Council who voted for the continuance of a bad system, are mere ciphers, looking through the aldermanic spectacles, and content to place their own vision in abeyance. The other one-fourth rule the roast, and try to pose as eminent financiers; putting on a look of grave expostulation, and shaking their wise heads when any rash innovator with besom in hand would disturb the municipal cobwebs.

I must admit that, so far as I am aware, the attempt is never made by any of its advocates to defend the present system on its merits. The argument of "expediency" is the one that is commonly employed. That is a convenient and plausible way of putting it; and if no actual wrong were done, it might be tolerated and accepted as fair to some extent. But the evil of the system is both immediate and far reaching; and the expediency argument must give way when it is plain that a policy of even-handed justice is desirable, as well as the true policy to adopt.

It is unfortunate that the financial administration of the gas undertaking should be such that, instead of the property being a boon to the ratepayers and consumers, it is a plague-spot for the spread of mischief. The system of drawing subsidies from one department to be spent in other departments, admitting of silent mischief being worked in these others, is the key-stone of much of the maladministration which has prevailed, and which of recent years has been brought home to us so forcibly. This system is answerable for many of the ills of our present condition; and those who uphold it are responsible for its effects, however much they may stand indignant, and deny their responsibility. Let every tub be placed on its own bottom; and we shall then know what's what, and who's who.

The Fates forbid that I should find fault with the Gas Committee for being able to sell 20-candle gas at 2s. per 1000 cubic feet. Let them have all the credit which the existence of such a fact deserves, and especially if they will only realize their duty under the circumstances and act up to it. At the proper price, the consumers would still be paying their way, and reproducing the capital of the undertaking by means of the sinking fund. More than that they cannot in justice be called on to do.

The truth is gradually being forced upon us that an infusion of new and vigorous life into the municipal work of Manchester is imperatively required. The unenviable notoriety we have attained by our high death-rate, and the recent disclosures that have been made of the conditions of existence in our slums, are proof of this, and that the policy of *laissez faire*, or something worse, must be discarded once for all. When every tub is made to stand on its own bottom, the good work will have been begun, and not before.

T. N.

Manchester, June 29, 1889.

THE PLYMOUTH CORPORATION AND THE WATER SUPPLY OF OUTLYING DISTRICTS.

SIR,—Herewith I send you copies of two Plymouth papers containing an announcement by the Borough Surveyor (Mr. G. D. Bellamy) as to the suspension of the constant supply of water in the borough, and some editorial comments thereon. I venture to call your attention to these articles; and in doing so would point out the "dog in the manger" policy followed by some Corporations (of which Plymouth may be taken as an example) in including within their area of supply adjoining and outlying parishes and places which they have not the means to supply with water. This will, I think, be shown by the following facts.

In 1867 the Plymouth Corporation obtained an Act of Parliament granting them further powers in connection with their water supply; and this Act included within their limits of supply many outlying parishes and villages (some of them many miles from the borough of Plymouth) which had not previously been included within those limits, subject to the proviso that the Corporation were not to serve any place outside the borough to the prejudice or injury of the constant supply of the borough. Notwithstanding this proviso, and the fact that their works are insufficient and inadequate for the proper supply of Plymouth alone, the Corporation are serving a large district outside the borough, are receiving a revenue of probably between £1000 and £2000 yearly from this source, and are endeavouring to obtain further supplies.

One of the outlying places referred to in the Act of 1867 is Tamerton Foliott. During the present session, the Plymouth Dock Water Company (better known as the Devonport Water Company) have been promoting a Bill in Parliament for powers to extend one of their reservoirs, which is situated in the parish of Tamerton Foliott, to change the name of the Company to the Devonport Water Company, and for other powers, including that to supply Tamerton Foliott. The parish is a large one of more than 4700 acres; but the largest portion of the population reside in the village of Tamerton, which is situated at one corner of the parish, and contains a population of about 1000 persons. The Plymouth Corporation have never afforded a supply of water to the village, and have no pipes within 1½ miles of the place. They have, however, given some supplies in another part of the parish. The Devonport Water Company have a large portion of their works in Tamerton Foliott parish, consisting of a reservoir, filter-beds, mains, &c., at a distance of about 1½ miles from, and at an elevation of some 250 feet above the level of, the village. The Company are considerably the largest ratepayers in the parish. The wells in the village, from which the inhabitants have up to now obtained their supply, are condemned as unfit for use. The Rural Sanitary Authority have applied to the Devonport Water Company for a supply of water to the village. The Company were willing to give the supply; and it was probable that terms could have been arranged between the Authority and the Company. But on the Company's Bill coming before a Committee of the House of Lords on the 2nd of April last, the Corporation of Plymouth opposed it; and Counsel for the Corporation stated that they were willing and able to supply water to Tamerton for all purposes. Consequently the clause in the Bill giving the Company power to supply was struck out by the Committee (see JOURNAL for April 16 last).

Now comes the question, What will be the sanitary condition of Tamerton during the present summer? The Plymouth Corporation have the power to supply it, but are prevented from doing so because they have not the water; and they would further run the risk of an injunction to restrain them from doing so by some inhabitant of the borough whose supply would be prejudiced thereby. The Devonport Company's works are well situated for supplying the village, and the Company are willing to do so—and, further, the Sanitary Authorities are anxious that they should do so; but Parliament will not give the Company the right to afford such supply. The village is therefore to be left in dire distress for water, with the possibility of an epidemic breaking out, because Parliament gave to a Corporation 20 years ago certain powers which the Corporation have allowed to remain dormant.

In granting an extension of limits of supply to a Company, Parliament now inserts—and has done for some time, at the instance of the Local Government Board—a clause to the effect that if the additional limits are not supplied within a limited period (usually five or seven years) then the restriction contained in section 52 of the Public Health Act, 1875, is to cease to apply so far as the Company are concerned. (See the Colne Valley Water Act, 1885; Sidmouth Water Act, 1886; Newport Water-Works Act, 1887; Barnstaple Water-Works Act, 1888; and various others.)

The Plymouth Corporation have for a period of some 30 years been talking about the necessity of having a storeage reservoir; yet judging from the articles which have recently appeared in the local papers, they have not yet decided even where the site of such reservoir shall be.

June 26, 1889. C. E.

THE DRY WEATHER AND THE WATER SUPPLY OF MANCHESTER.—In view of the probable continuance of the present dry weather, the Water-Works Committee of the Manchester Corporation have thought it necessary to call public attention to the following facts in connection with the water supply:—Last Friday there was the largest consumption on record—viz., 27,510,000 gallons, which, with 13,600,000 gallons given for compensation down the river, made the total consumption out of stock 41,110,000 gallons; and as only about 10,000,000 gallons came in from the springs and other sources, it will be seen that there was a loss from the stock of upwards of 30,000,000 gallons on that day alone. The Committee do not wish to create alarm, as there is a moderate quantity of water in store; but they think it most desirable that every reasonable economy should be practised by consumers as far as possible, in order to obviate the necessity of resorting to the means which had to be adopted in 1887.

SETTLEMENT OF THE RASTRICK WATER QUESTION.—As a result of the negotiations which have been pending for some time between the Special Water Committee of the Rastrick Local Board and the Directors of the Rastrick Water Company, in regard to the purchase of the undertaking by the Board, it is reported that a settlement has now been arrived at. It is stated that the price agreed upon is £15,250, for which sum the Local Board will obtain the whole of the water-works, with all privileges and rights. The Company's application to Parliament, which was recently opposed by the Local Board before a Committee of the House of Lords, is to be proceeded with, and will shortly come before a Committee of the House of Commons. The Bill will now practically be the Local Board's. When the Company first intimated their intention of applying for parliamentary powers, the Local Board offered £7000 for the undertaking. This was refused; and the Directors of the Company succeeded in getting the preamble of their Bill proved before the Lords Committee. This, doubtless, induced the Local Board to increase their offer. The Company was formed about 20 years ago; and its capital is £6000, fully paid up.

PROJECTED WATER SCHEME FOR BILSTON.—The Bilston Township Commissioners, at their meeting last Wednesday, had under consideration a report by the Water and Baths Committee, in which they stated that they had fully considered the question of obtaining an independent and supplementary supply of water for the township, and recommended the Commissioners to take steps under the provisions of the Public Health Act, 1875, to obtain such supply, and for this purpose to apply to the Local Government Board to sanction a loan of £19,000. On the motion of Mr. Price, seconded by Mr. Hill, it was decided to apply to the Local Government Board to sanction a loan not exceeding £20,000 for the proposed water-works; that Mr. Baldwin Latham, C.E., be employed to prepare a plan of the works; and that the Water Committee be authorized to enter into a provisional agreement for the purchase of land as a site for the works. Mr. Holcroft stated that the supply of 220,000 gallons of water per day, which under their contract was the minimum amount the Commissioners had to take from the Wolverhampton Corporation, was inadequate; and the Commissioners found that they could themselves supply water at 3d. per 1000 gallons, whereas they now had to pay the Wolverhampton Corporation 5d. per 1000 gallons for it. The supply from the Corporation under the present 21 years' contract would continue; but the Board intended to reduce it to its minimum amount, and give a good supply to the town themselves. Mr. Hill said the proposed scheme had been brought about by the manner in which the Wolverhampton Corporation had treated the Board. The Board would have been content if the Corporation had reduced the price to 4d. per 1000 gallons; but they wanted to increase it to 6d., and when they went to arbitration on the matter, it was fixed at 5d., which was still too much.